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PESTICIDES ABSTRACTS

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PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstracts Bulletin) is a monthly publication of the Management Support Division of the Office of Pesticides and Toxic Substances, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

Publication of an abstract, annotation, or citation does not imply endorsement by the Environmental Protection Agency of the original article or of commercial materials, equipment, or processes mentioned therein.

CONTENTS

Volume 14 **October 1981** **No. 10**

Page

General 779
(Phytotoxicity studies: information on production and use; and other items of general interest. Includes news items, letters and editorials appearing in scientific and technical journals.)

Monitoring and Residues 789
(levels of pesticides in people or nonexperimental animals or in water, air, soil, food, feed, and other consumer products)

Epidemiology, Prevention and Treatment 802
(Frequency and distribution of pesticide poisoning in man or nonexperimental animals and treatment of clinical cases; morbidity and mortality; safety measures; decontamination; disposal of containers and wastes; legislation and regulations)

Toxicology and Pharmacology 808
(Toxicity studies in man and animals; effects on cells; organs, and systems; metabolic studies, biochemistry, interactions; antidotes and other treatment; mode of action. Ordinarily, articles dealing with efficacy studies are not included.)

Analysis 838
(preparation of samples; analytical methods; instrumentation)

81-2701. Lamoureux, G. L.; Rusness, D. G. (Metab. & Radiat. Res. Lab., Agric. Res., SEA, USDA, Fargo, ND 58105) **Catabolism of glutathione conjugates of pesticides in higher plants.** *ACS Symp. Ser.* 158(CH09): 133-164; 1981 (26 references).

Studies are reported regarding the conversion of many pesticides to glutathione (GSH) conjugates in higher plants. Pentachloronitrobenzene- UL-^{14}C ([^{14}C]PCNB; [^{14}C]quintozene) was chosen for use in most of the studies. *In vivo* experiments were carried out with 30-day-old peanut plants grown in solutions containing 17.6 ppm [^{14}C]PCNB. In addition, barley, corn, cotton, onions, soybeans and lake water rich in blue green algae were studied following incubation with [^{14}C]PCNB. *In vitro* studies were also carried out, with enzymes extracted from peanut, pea and onion. Water-soluble, ether soluble, insoluble, and methylene chloride-soluble residues are described. The sequence of reactions that occur during the metabolism of PCNB is described; the first step, conjugation with glutathione, occurs at several different sites. It is concluded that *N*-malonylcysteine conjugates may be produced from a variety of pesticide GSH conjugates in a variety of important plant species, and they appear to be stable end-products of metabolism.

81-2702. Haquenne, W.; Salembier, J. F.; Belien, J. M. (Stn. Phytopharm. Etat, Gembloux, Belgium) **Effets residuels de l'atrazine appliquee en culture de mais sur la betterave sucriere subsequente traitee avec differents programmes de desherbage. [Side-effects of atrazine applied in maize crops on weed control programs in sugar beet.]** *Belg. Inst. Verbetering. Beit Driemaand.* 48(4): 179-197; 1980 (Multilingual).

In 1977, concentrations of 0.625, 1.375, and 2.125 kg/ha atrazine were applied to maize crop. In 1979 1, 1.75, and 2.25 kg/ha atrazine was applied. The effect of these treatments on subsequent sugar beet crops treated with antigraminaceous herbicides (diallate, cycloate, and ethofumesate) and/or antidicotyledon herbicides (lenacil, chloridazone, metamitrone, phenmediphame) were compared with respect to the number of plants which came up and sugar yields. A deleterious effect of atrazine was noted only on the test plot treated with the highest (2.5 kg) atrazine dose. The various herbicides behaved similarly; sugar beet plant numbers were reduced at higher atrazine doses applied (> 1.75 kg). [This paper is published in French and Flemish.]

81-2703. Gorski, T. (Dep. Toxicol., Natl. Inst. Hyg., PL-00791 Warsaw, Poland) **Presence of polychlorinated dibenzo-*p*-dioxins in latex nipples.** *Bull. Environ. Contam. Toxicol.* 27(1): 68-71; 1981 (15 references).

Two types of latex nipples purchased in a Warsaw department store were examined for polychlorinated dibenzo-*p*-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs). Sources of PCDDs and PCDFs include commercial chlorophenols, including PCP, which is used as a fungicide and antimicrobial agent in rubber plantations. Analysis was made by high performance gas chromatography. The concentration of hexachlorodibenzo-*p*-dioxins in the 2 nipple types ranged from 0.03 to 0.6 ppb. Concentrations of heptachlorodibenzo-*p*-dioxins ranged from 0.1-4.1 ppb. Concentrations of octachlorodibenzo-*p*-dioxins ranged from 0.8 to 11.2 ppb. Concentrations for similarly chlorinated dibenzofurans were 0.02 to 0.8, 0.1, to 3.1, and 0.3 to 2.8 ppb, respectively. Extraction of nipples with water resulted in no detectable levels of these toxic compounds in the water, suggesting that they present no real risks for infants.

81-2704. Sanders, H. J. (Author address not given) **Herbicides.** *Chem. Eng. News* 59(31): 20-35; 1981.

The development and use of herbicides in the United States is reviewed. The use of herbicides on farms has increased 280% to 475 million lb/yr over the past 15 yr. Currently herbicides account for nearly 60% of all pesticides used in the US. The introduction of new compounds that are more effective in controlling a wide spectrum of weeds in a variety of crops has stimulated herbicide consumption. Another factor in increased herbicide use is the increased cost of gasoline to operate tractors for mechanical cultivation. About 75% of the herbicides used in the US are on farms; the remaining 25% are used for railway and powerline rights-of-way, industrial sites, roadsides, waterways, rangelands, vacant lots, and home lawns and gardens. Recent advances include more specific target crops for several herbicides, herbicides that are effective in smaller doses, safeners that protect non-target crops, more understanding of the mode of action of the chemicals, new application methods, better methods of controlling weeds, increasing use of postemergence herbicides, use of herbicide combinations, integrated pest control ideas, and increased safety concerns on the part of the public and the manufacturers. Government regulations are briefly considered. Modes of action of specific products are discussed. The common name, trade name, structural formula, US producer, and year of commercial introduction are listed for 40 agriculture chemicals.

81-2705. Anonymous **Dow hit with lawsuit on Tordon herbicide.** *Chem. Mark. Rep.* 220(1): 5-24; 1981.

A suit has been filed against Dow Chemical Company by 4 families in Knoxville, Tennessee. The suit, totaling almost $14 million, is in connection with Tordon 101, which was used by the US Forest Service to defoliate trees near the families' homes. Tordon 101 contains the herbicides 2,4-D and picloram. Plaintiffs charge a number of disorders and claim that the product should not have been employed. Dow describes the product as a brush control and vegetation management tool, noting that this is the use for which it is registered.

81-2706. Anonymous **Aerial spraying of malathion in California prompts conflicting opinions about health.** *Chem. Mark. Rep.* 220(3): 3, 24; 1981.

The dispute between academic and industry experts over the possible health effects of aerial spraying of malathion in California is discussed. Spraying for the Mediterranean fruit fly was initiated because state and federal officials feared that, if left unchecked, the fly might spread from the localized Santa Clara County region to the important agricultural areas of the state. Officials of the California Department of Health stated that spraying posed minimal risk to residents. A Stanford University biologist considers the spraying to pose undue risk to the residents. Manufacturers representatives stated that the compound is not mutagenic or carcinogenic.

81-2707. Anonymous **EPA drops rotenone from its RPAR list.** *Chem. Mark. Rep.* 220(3): 16; 1981.

The EPA has announced that rotenone has been removed from its list of suspect chemicals and placed on the RPAR (rebuttable presumption against registration) list. This action was taken because a study that indicated oncogenicity of rotenone could not be duplicated.

81-2708. Olausson, I. C., ed.; Cato, I., ed. (Mar. Geol. Lab., Univ. Goteborg, Goteborg, Sweden) **Chemistry and Biogeochemistry of Estuaries.** (John Wiley & Sons Ltd.: Chichester): 452 pp.; 1980.

The physical, chemical, and geological aspects of estuaries are discussed. The book is intended as a monograph for those working in the environmental sciences (geographers, geologists, biologists, oceanographers, chemists). Specific topics covered in the 13 chapters included suspended matter, sediment transport, inorganic pollutants, chlorinated hydrocarbons, pollution, and the decontamination of estuaries. Abstracts of chapters from this book will appear in the appropriate sections of this issue of *Pesticides Abstracts.*

81-2709. Baskakov, Yu. A.; Shapovalov, A. A.; Zhirmunskaya, N. M.; Ovsyannikova, T. V. (All-Union Res. Inst. Chem. Means Plant Prot., Moscow, USSR) **O vzauosvyazi rostreguliruyshchei aktivonsti i fitotoksichnosti sinteticheskikh tsitokininov. [Interrelationship between growth regulating activity and phytotoxicity of synthetic cytokinins.]** *Dokl. Akad. Nauk SSSR* 257(6): 1514-1516; 1981 (9 references) (Russian).

The effect of DPX-4189, thiadiazuron, kinetin, and diphenylurea on tobacco, barley, lettuce, cucumber, and *Arabidopsis thaliana* (L.) Heynh. was studied. Compounds manifesting cytokinin activity at low concentrations possessed higher phytotoxicity. There was a close relationship between growth regulating ability and herbicidal activity in DPX-4189 and thiadiazuron. Phytotoxicity appeared to be caused by the phenomenon hypercytokininosis. There was a great similarity in the character of the toxic effects of DPX-4189, thiadiazuron, and increased doses of natural kinetin and diphenylurea.

81-2710. Haque, R., ed. (Off. Res. & Dev., US EPA, Washington, DC) **Dynamics, Exposure and Hazard Assessment of Toxic Chemicals.** (Ann Arbor Sci. Publ. Inc.: Ann Arbor): 496 pp.; 1980.

Transport and fate studies that predict exposure, hazard, and dynamics of toxic substances in the environment are described, and the role of these studies in decisions regarding the handling of toxic chemicals is considered. Papers are included that were presented at the symposium Dynamics, Exposure and Hazard Assessment of Toxic Chemicals in the Environment, held at Miami Beach, Florida, September 11-13, 1978. These papers discuss photochemistry; volatilization; hydrolysis; biodegradation; transport in sediments and humic sediments; partition coefficients; and movement, accumulation, and transformation in fish and animals. The occurrence of toxic impurities in commercial products is also considered. Abstracts of chapters from this book will appear in the appropriate sections of this issue of *Pesticides Abstracts.*

81-2711. Fine, D. H.; Krull, I. S.; Rounbehler, D. P.; Edwards, G. S.; Fox, J. G. (New Engl. Inst. Life Sci., Waltham, MA 02154) **N-Nitroso compound impurities in consumer and commercial products.** In: *Dynamics, Exposure and Hazard Assessment of Toxic Chemicals.* Haque, R., ed. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH26: 417-423; 1980 (22 references).

Several reports of N-nitroso compounds found as impurities in commercial products and processes are reviewed. N-nitrosodimethylamine (NDMA) was found in fish meal and in NDMA open formula rat and mouse ration for laboratory animals. In 1977, N-nitrosodipropylamine (NDPA) was reported as an impurity in the herbicide trifluralin at the 154,000 ppb level. Subsequent studies showed the NDPA to be present in all dinitroaniline-based herbicides. NDPA was reduced to 18,000 ppb through changes in the manufacturing process. Current studies report the level of this impurity to be 500 ppb.

81-2712. Westigard, P. H.; Lombard, P. B.; Allen, R. B.; Strang, J. G. (Oregon State Univ., South. Oregon Exp. Stn., Medford, OR 97502) **Pear psylla: population suppression through host plant modification using daminozide.** *Environ. Entomol.* 9(3): 275-277; 1980 (11 references).

Two applications of the plant growth regulator daminozide at 2000 ppm, timed approximately 30 and 50

days following full bloom of Bartlett pears, resulted in reduced terminal shoot growth and subsequently in lowered pear psylla (*Psylla pyricola* Foerster) nymphal densities, and in reduced honeydew fruit damage. Over a 3-yr period shoot growth was reduced an average of 33%; psylla nymph density and damaged fruit were reduced 35 and 57%, respectively, compared to the untreated check. (Author abstract by permission)

81-2713. Mel'nikov, N. N. (All-Union Res. Inst. Chem. Means Plant Prot., Moscow, USSR) **Razvitie nauchno-issledovatel'skikh rabot v oblasti khimicheskikh sredstv zashchity rastenii. [Development of research in the field of chemical agents for plant protection.]** *Izv. Akad. Nauk SSSR Ser. Biol.* (3): 337-347; 1981 (Russian).

The current status of pesticide development for plant protection was reviewed. Thirty-three main classes of compounds were discussed. Passage of the Cl-containing insecticides aldrin, dieldrin, DDT, and methoxychlor into cow's milk was considered as a function of content in fodder. The main requirements in developing new pesticides were enumerated: moderate persistence; low toxicity to beneficial organisms (including aquatic organisms); relatively rapid breakdown in soil, water, and atmosphere; absence of accumulation in the human body, animals, birds, and aquatic organisms; and absence of toxic effects in humans, animals, and cultivated or protected plants.

81-2714. Sokolov, M. S.; Sokolova, E. B.; Goncharak, E. I.; Shostak, L. B. (Inst. Agrochem. & Soil Sci., Acad. Sci. USSR, Puschino, USSR) **Ekologo-agrokhimicheskaya otsenka i prognoz posledeistviya pestitsidov (na primere USSR i MSSR). [Ecological and agrochemical assessment and prediction of pesticide effects (as exemplified by the Ukrainian and Moldavian SSR).]** *Izv. Akad. Nauk SSSR. Ser. Biol.* (3): 359-368; 1981 (19 references) (Russian).

Of the pesticides used in the USSR, the following 18 have been selected as most dangerous: metaphos (methyl parathion), hexachlorocyclohexane (BHC), DDT, dinitro-o-cresol (DNOC), intrathion (thiometon), PCP, PCK, polydophen, Sevin (carbaryl), zinc phosphide, Granosan (ethylmercuric chloride), Karathane (dinocap), Karbathion (metham-sodium), tetramethylthiuram disulfide (thiram), phenthiuram, ziram, and polydim. Conventional rates of application were calculated for the Ukrainian and Moldavian SSR and watershed areas of the main rivers in the region on the basis of soil self-cleansing capacity. Measures for prevention of environmental pollution include use of less harmful pesticides, avoidance of aerial spraying, and special care in zones of possible secondary accumulation in estuarine waters.

81-2715. Cossey, A. L.; Phillips, J. N.* (CSIRO, Div. Plant. Ind., Canberra City A.C.T., Australia) **3-Alkoxyuracil derivatives. 1. Herbicidal activity.** *J. Agric. Food Chem.* 29(4): 716-718; 1981 (5 references).

The herbicidal activities of a series of 3-alkoxyuracil derivatives have been evaluated, pre- and post-emergence, against a variety of plant species. 3-Alkoxy-5-bromo- 6-methyluracils containing 3-4 carbon atoms in the alkoxy group have been shown to be potent nonselective preemeergent herbicides. Pre- and postemergent herbicidal activities were tested in peas, mustard, linseed, and barley; pre-emergent activity was also tested in maize and ryegrass, and postemergent activity was tested in sugar beet and buckwheat. They appear to act by inhibiting photosynthesis and are comparable in effectiveness to the uracil herbicide, bromacil. When applied postemergence, they are less effective, though more selective, than bromacil. (Author abstract by permission, modified)

81-2716. Brown, B. T.; Phillips, J. N.; Rattigan, B. M. (CSIRO, Div. Plant Ind., Canberra City, A.C.T., Australia) **3-Alkoxyuracil derivatives. 2. Hill inhibitory activity.** *J. Agric. Food Chem.* 29(4): 719-722; 1981 (17 references).

A study was conducted to determine the relationship between molecular structure and Hill-reaction-inhibiting activity of 3-alkoxyuracil derivatives of the herbicide bromacil. The test system used was a mixture containing chloroplasts of *Pisum sativum* and the dye TCIP, serving as the electron acceptor. The rate of dye reduction was measured at 620 nm. The activity of inhibitors was expressed in terms of pI50. Lipophilicity was determined as partition coefficients between 1-octanol and aqueous phosphate buffer. The inhibitory activity of the test compounds was directly proportional to lipophilicity. Inhibition appears to result from the interaction of the 3-alkoxy substituents with a lipophilic region close to an active center in the chloroplast. Varying the 1, 5, and 6 substituents appears to affect the interaction of the amide function in the uracil with the active site.

81-2717. Anderegg, B. N.; Lichtenstein, E. P.* (Dep. Entomol., Univ. Wisconsin, Madison, WI 53706) **A comparative study of water transpiration and the uptake and metabolism of (^{14}C)phorate by C_3 and C_4 plants.** *J. Agric. Food Chem.* 29(4): 733-738; 1981 (18 references).

Physiological and anatomical differences existing between C_3 (*Atriplex patula*, oats, peas, barley, and wheat) and C_2 (*Atriplex rosea*, corn, sorghum, and millet) plants were utilized to investigate the mechanism of uptake, translocation, and metabolism of soil-derived [^{14}C]phorate residues by plants. C_3 plants transpired 2.5 times more water and took up twice as much [^{14}C]phorate residues than did C_4 plants, indicating that a direct correlation existed between the water transpired and the uptake of radiocarbon by all plants. Ranked in decreasing order of water transpired, their order was barley, oats, wheat, peas,

A. patula, sorghum, *A. rosea*, corn, and millet. A similar pattern was noted relative to radiocarbon accumulation. Metabolism studies indicated that relatively greater amounts of water-soluble and smaller amounts of benzene-soluble radiocarbon were recovered from C_3 plants (*A. patula* and oats) than from C_4 plants (*A. rosea* and corn). Phorate sulfoxide and phorate sulfone were apparently further oxidized in plant tops into phoratoxon sulfoxide and phoratoxon sulfone, more so in oat leaves than in corn leaves. (Author abstract reprinted by permission of the American Chemical Society)

81-2718. Still, G. G.; Balba, H. M.; Mansager, E. R. (SEA, USDA, Washington, DC) **Studies of the nature and identity of bound chloroaniline residues in plants.** *J. Agric. Food Chem.* 29(4): 739-746; 1981 (26 references).

When rice plants grown hydroponically were treated with [^{14}C]-3-chloroaniline or [^{14}C]-3,4-dichloroaniline, degradation products of substituted phenylamide pesticides, more than 40% of the ^{14}C was found in the roots in isolated lignin fractions. A coniferyl alcohol polymerization system was developed for the preparation of a model copolymerization to yield synthetic chloroaniline-lignin copolymers. Gel permeation chromatography, mass spectrometry, ^{13}C NMR, and pyrolysis-gas chromatography were used to study the structure of the synthetic copolymers. Results indicated that chloroanilines may be bonded covalently to lignin via 1,6 addition to a quinone methide intermediate during the lignin synthesis. The α-carbon in the lignin side chain (the benzylic carbon) is the most likely chloroaniline nitrogen binding site. (Author abstract reprinted by permission of the American Chemical Society, modified)

81-2719. Nagy, S.; Wardowski, W. F. (Florida Dep. Citrus, Agric. Res. & Educ. Cent., Lake Alfred, FL 33850) **Diphenyl absorption by Honey tangerines: the effects of washing and waxing and time and temperature of storage.** *J. Agric. Food Chem.* 29(4): 760-763; 1981 (22 references).

Temperature, storage time, fruit preparation, number of diphenyl (biphenyl) pads packed/carton, and harvest time were evaluated to determine their influence on the extent of diphenyl absorption by Honey tangerines. Washed and waxed fruit stored for 4 wk at 4 and 21°C absorbed about 20-25 and 50-65 ppm of diphenyl, respectively, when packed with 1 diphenyl pad and about 25-35 and 70-85 ppm, respectively, with 2 diphenyl pads. Unwashed fruit stored under similar conditions absorbed about 10-15 and 45-60 ppm, respectively, with 2 pads. Storage of fruit packed with 2 diphenyl pads afforded the greatest protection against decay, but temperature and storage time must be carefully controlled because of the higher amounts of diphenyl absorbed. The average diphenyl contents of fruit stored at 21°C with 2 diphenyl pads were below the legal tolerance limit (110 ppm) established by the United Stages but not necessarily below the European and Japanese tolerance of 70 ppm. (Author abstract reprinted by permission of the American Chemical Society)

81-2720. Drinkwine, A. D.; Fleeker, J. R.* (Dep. Biochem., North Dakota State Univ., Fargo, ND 58105) **Metabolism of 2,5-dichloro-4- hydroxyphenoxyacetic acid in plants.** *J. Agric. Food Chem.* 29(4): 763-766; 1981 (25 references).

The 2,4-dichlorophenoxyacetic acid (2,4-D) metabolite, 2,5-dichloro-4- hydroxyphenoxy[1- ^{14}C]acetic acid ([*acetic*-1-^{14}C]-4-OH-2,5-D) was prepared. The labeled compound was taken up by red currant and carrot shoots and by the roots of intact bean, wheat (durum), and corn plants. After 48 hr the tissue was freeze-dried and extracted. From 19 to 32% of the label remained in the residual plant material. A small portion of the radioactivity, 1-10%, was recovered as [^{14}C]carbon dioxide. From 9 to 31% of the [^{14}C]-4-OH-2,5- D was found unchanged and 15-50% was recovered after treatment of the extracts with emulsin. A large portion of the radioactivity, 29-40%, was highly polar material and not identified. The chromatograms of the plant extracts suggested that the metabolic products were similar. (Author abstract reprinted by permission of the American Chemical Society)

81-2721. Flore, J. A.; Bukovac, M. J. (Dep. Hortic., Michigan State Univ., East Lansing, MI 48824) **Pesticide effects on the plant cuticle. IV. The effect of EPTC on the permeability of cabbage, bean, and sugar beet cuticle.** *J. Am. Soc. Hortic. Sci.* 106(2): 189-193; 1981 (27 references).

Studies were conducted to determine the effects of the pesticide EPTC on the permeability of the cuticle of several plants. Cuticle penetration of (^{14}C-1-naphthaleneacetic acid (^{14}C-NAA) and cuticular transpiration were measured in control leaves and leaves exposed to 3-4 kg EPTC/ha. Cuticular transpiration increased. Penetration of NAA increased 200% in bean, 121% in sugar beet, and 141% in cabbage. Permeability decreased up to 28 days after exposure, then remained stable until the experiment was terminated. It is concluded that exposure to EPTC inhibits wax development in the cuticle resulting in increased transpiration and penetration of NAA.

81-2722. Roush, R. T.; Hoy, M. A.* (Dep. Entomol. Sci., Univ. California, Berkeley, CA 94720) **Laboratory, glasshouse, and field studies of artificially selected carbaryl resistance in *Metaseiulus occidentalis*.** *J. Econ. Entomol.* 74(2): 142-147; 1981 (12 references).

Laboratory and glasshouse tests were conducted to assess the vigor and reproductive compatibilities of two

laboratory-selected carbaryl resistant strains of a predatory mite, *Metaseiulus occidentalis* (Nesbitt). Traits evaluated included development time, fecundity, sex ratio, mating compatibilities and competition, diapause, persistence of the carbaryl resistance characteristic, and the capability to control spider mite populations under carbaryl sprayed and unsprayed conditions. The resistant strains did not differ significantly from the susceptible strains tested in the absence of carbaryl treatment. The resistant strains were released in almond orchards where they survived carbaryl applications, controlled spider mite populations, and overwintered. This is believed to be the first time that the field effectiveness of a biological control agent has been improved through artificial selection. (Author abstract by permission)

81-2723. Stehn, R. A.; Johnson, E. A.; Richmond, M. E. (New York Coop. Wildl. Res. Unit, Dep. Nat. Resour., Cornell Univ., Ithaca, NY 14853) **An antibiotic rodenticide for pine voles in orchards.** *J. Wildl. Manage.* 44(1): 275-280; 1980 (19 references).

The inadvertent discovery of an alternative to the use of endrin for control of pine voles in orchards is reported. Apple slices were coated with DMCT, a fluorescent tooth and bone marking substance, during tests for optimal bait spacing. The pine voles consuming the treated bait died; laboratory and field tests were conducted to confirm the lethal effects. In laboratory tests, single oral doses of 400 or 2000 mg/kg resulted in 85% mortality. Higher mortality was observed in animals fed a vegetation diet, rather than a laboratory chow diet. Necropsy showed an enlarged, watery cecum; the contents of the lower intestine were also watery. It is suggested that the cause of death may have been superinfection by gram-negative bacteria, leading to severe enteritis. Field tests indicated that DMCT reduced vole numbers at least as much as other baits concurrently tested, but these preliminary tests do not indicate a specific mortality rate or an appropriate application rate. The possibility of developing an antibiotic for control of pine voles is suggested.

81-2724. Ivashina, S. A. (Author address not given) **Deistvie fozalona i metafosa na mikrofloru pochvy. [Effect of phosalone and metaphos on soil microflora.]** *Khim. Sel'sk. Khoz.* 19(5): 27-28; 1981 (6 references) (Russian).

Introduction of phosalone in meadow-chernozem soil at doses of 5 and 50 mg/kg led to a decrease in saprophyte content by 1-2 orders of magnitude within 2 wk. A similar change in the number of soil saprophytes was also noted in gray forest soil when phosalone was applied at a concentration of 50 mg/kg. In soil polluted with metaphos (methyl parathion) such changes were not observed. The number of ammonifying microorganisms was the most sensitive index characterizing the effect of pesticides on microbiological processes in soil. A phosalone concentration of 0.5 mg/kg and a metaphos concentration of 0.1 mg/kg may be considered critical (threshold) concentrations.

81-2725. Vlasova, E. P. (All-Union Res. Inst. Broadbean & Groat Crops, USSR) **Gerbitsidy na posevakh gorokha. [Herbicides on young pea crops.]** *Khim. Sel'sk. Khoz.* 19(5): 52-54; 1981 (5 references) (Russian).

The effects of Basagran (bentazon), linuron, and Treflan (trifluralin) on yield and quality of pea seeds and elements of its structure were studied. The chlorophyll content in pea plant leaves taken in the period of massive flowering decreased in Treflan variants and increased with the other herbicides. Basagran at a dose of 1.5-2.0 l/ha did not affect the crude protein content in pea seeds and the amino acid composition of the protein. Linuron and Treflan decreased the valine content by more than 10% and lysine, somewhat. Residual quantities of linuron, Basagran, and Basagran M were not found in pea seeds, with the exception of Basagran introduced at a dose of 4 l/ha; in this case residues of 0.04 mg/kg were found in 1978 and 0.08 mg/kg in 1979.

81-2726. Bondarenko, G. L.; Ledovskaya, G. P.; Vitanov, A. D. (Ukr. Res. Inst. Veg. & Melon Cult., Knarkov, Ukrainian SSR) **Kachestvo ovoshchnoi produktsii pri khimicheskoi propolke posevov. [Quality of vegetable production during chemical weeding of young crops.]** *Khim. Sel'sk. Khoz.* 19(5): 54-58; 1981 (9 references) (Russian).

The effect of Tillam (pebulate), Ramrod (propachlor), Treflan (trifluralin), diphenamid, and trefmid (a mixture of diphenamid and trifuralin) on tomato productivity, quality of canned tomatoes, and the effect of prometryne and linuron on pea productivity and quality of canned green peas was studied. Tillam (4.5 kg/ha), Treflan (0.6 kg/ha), diphenamid (6.5 kg/ha) and the mixture trefmid (0.3 + 4 kg/ha) did not adversely affect the quality of fresh and canned tomatoes. Prometryne (1.5 kg/ha) and linuron (2.0 kg/ha) did not adversely affect the quality of fresh and canned green peas. Ramrod accumulated in tomato fruits and in canned products as well as in soil, which made it unsuitable. Ramrod and trefmid are not used on tomatoes, nor linuron on green peas.

81-2727. Webb, D. B.; Davies, C. G. (Dep. Renal Med., K.R.U.F. Inst., R. Infirm., Cardiff CF2 1SZ, Wales) **Paraquat poisoning and kidney function tests.** *Lancet* 1(8235): 1424; 1981.

In this letter to the editor the interpretation of kidney function tests in paraquat poisoning is discussed. Paraquat is renally excreted, but the extent to which paraquat clearance will exceed glomerular filtration rate ex-

pressed as creatinine clearance must be interpreted with caution. A significant interference, the nature of which is unknown, has been detected. A correction curve that must be used to interpret the test is presented.

81-2728. Johnson, F. E.; Kugler, M. A.; Brown, S. M. (Dep. Surg., Med. Cent., St. Louis Univ., St. Louis, MO 63104) **Soft tissue sarcomas and chlorinated phenols.** *Lancet* 2(8236): 40; 1981.

In this letter to the editor the cases of a father and son, both employed at the same chemical plant, who developed soft tissue sarcomas are reported. The 33-yr-old son developed a fibrosarcomatous mesothelioma and subsequently died of widespread metastases. The 53-yr-old father developed liposarcoma of the posterior thigh and buttock, and was given radiation therapy. The chemical plant manufactured a large volume of chlorinated phenols. It is noted that 2,4-dichlorophenol can, under certain thermal conditions, be a precursor of 2,4-D and 2,4,5-T.

81-2729. Musalevski, A.; Shopova, M.; Shange, T.; Petrovska, D.; Najchevska, C.; Stojkovski, C.; Sekovski, Z. (Fac. Agric., Univ. Skopje, Skopje, Yugoslavia) **The effect of herbicide trifluralin on root mitosis and meiosis in *Gossypium herbaceum*.** *Mutat. Res.* 85(4): 229; 1981.

The roots of cotton (*Gossypium herbaceum*) were treated with different concentrations of the herbicide trifluralin. The treated material was fixed for analysis of mitosis and meiosis. In the root tips were observed c-mitosis, reduction in mitotic index, the presence of polyploid cells and different types of chromosome aberration, correlated with the concentration of the agent used. (Author abstract by permission)

81-2730. Petrovska, D.; Shopova, M.; Musalevski, A.; Najchevska, C.; Sekovski, Z.; Stojkovski, C. (Fac. Agric., Univ. Skopje, Skopje, Yugoslavia) **Some cytological effects of herbicide trifluralin in *Allium cepa* L.** *Mutat. Res.* 85(4): 229-230; 1981.

The primary roots of *Allium cepa* were treated with different concentrations of the herbicide trifluralin. The treatment was conducted with 3 exposures (2, 4, and 6 hr). Depending of the concentration and exposure, effects varied from inhibition of the mitotic spindle and disturbance of cytokinesis, to chromosomal aberration such as the formation of bridges, fragments, lagging chromosomes, and uneven gametes. (Author abstract by permission, modified)

81-2731. Najchevska, C.; Musalevski, A.; Petrovska, D.; Sopova, M.; Stojkovski, C.; Sekovski, Z. (Fac. Agric., Univ. Skopje, Skopje, Yugoslavia) **Morphological and cytological effects of the herbicide trifluralin on *Glycine hispida* max.** *Mutat. Res.* 85(4): 230; 1981.

The treatment on *Glycine hispida* max., varieties Corsoy, Merit and Hark, was undertaken with trifluralin in laboratory conditions. The seeds were treated with different concentrations. The effect of treatment was investigated morphologically and cytologically. There are not many differences between the varieties in the percentage and type of the irregularities after the treatment with trifluralin. (Author abstract by permission)

81-2732. Mottura, A.; Zei, G.; Nuzzo, F.; Crimaudo, C.; Giorgi, R.; Veneroni, P.; Paggini, L.; Mocarelli, P.; Fraccaro, M.; Nicoletti, B.; De Carli, L. (Cytogenet. Collab. Group, Reg. Lombardia, Italy) **Evaluation of results of chromosome analyses on lymphocytes of TCDD exposed subjects after the Seveso accident.** *Mutat. Res.* 85(4): 238-239; 1981.

On the basis of preliminary results of the cytogenetic analysis on TCDD exposed subjects from the Seveso area, a more systematic scoring of the available slides has been performed according to an incomplete balanced blocks statistical design. The subjects were distributed into 3 classes, namely acute exposure, including zone A residents, chronic, including ICMESA workers, and control persons from the surrounding non-contaminated areas. Each sample of slides, composed of 45 units, was subdivided into 3 subgroups of 15 units and distributed among 3 different laboratories for duplicate scoring. An analysis of variance was carried out on $\sin^{-1} p$ transformed values corresponding to the frequencies of cells with chromosome aberrations. No significant differences were found between exposure categories for any of the following 4 combinations: 48 and 72 hr cultures, aberrations including or excluding gaps. However, significant differences were observed between scorers in the frequencies of aberrations at 72 hr, within exposure categories. Comparable results have been obtained by calculating the proportion of mitotic samples with at least 1 aberrant cell in the various categories. (Author abstract by permission)

81-2733. Sbrana, I.; Rusciano, D.; Lascialfari, D.; Lari, T.; Loprieno, N. (Lab. Genet., Univ. Pisa, Italy) **Cytogenetic and genotoxic studies on rabbits, cattle, mice, rats, and human cells accidentally or experimentally exposed to the dioxine TCDD.** *Mutat. Res.* 85(4): 278; 1981.

As a consequence of the Seveso accident in North Italy in July 1976 the release of tetrachlorodibenzo-*p*-dioxine (TCDD) contaminated a fraction of the general population as well as plants and domestic animals living in that zone. A detailed program of genetic investigations was started with the aim to evaluate genetic damages already produced in accidentally exposed animals and the potential genotoxic effect of TCDD on experimental animals. Some

rabbits and cattle accidentally exposed were analyzed for the existence of somatic cytogenetic damages and the fertility was followed up for some of them. Experiments for the evaluation of the induction of chromosome aberrations in bone marrow cells have been performed on mice treated acutely with 10 μg/kg of TCDD and on rats treated chronically for 10 mo at 3 dosage levels of TCDD (0.01, 0.1, 1.0 μg/kg). Moreover the ability of TCDD to induce microsomal mixed oxidase function has been evaluated by using cyclophosphamide as an *in vivo* chromosome breaking agent. (Author abstract by permission)

81-2734. Hartley-Asp, B. (Pharmacol. Dep., AB Leo, S-25100 Helsingborn, Sweden) **Comparative clastogenicity of analogues of the insecticide tepa in *Vicia faba* root-tip cells.** *Mutat. Res.* 85(4): 300; 1981.

A number of tepa analogues of established chemosterility containing different numbers of aziridine rings and with side chains of various lengths are available. Eight analogues, including tepa and hempa, were tested for their ability to produce chromosomal aberrations in *Vicia faba* root-tip cells. The choice of test material was made due to the fact that plants are often the secondary recipients of insecticides and receive relatively large amounts of a compound during spraying. Tepa and 6 analogues at 7.5×10^{-4} and 10^{-3} *M* produced a significant increase in the chromosomal aberration yield. The total number of aberrations found was dependent both upon the number of aziridine rings present in the compound and the number of carbon atoms in the side chain. Hempa, however, which is as effective a chemosterilant as tepa, does not produce chromosomal aberrations in *Vicia faba* root-tip cells. (Author abstract by permission)

81-2735. Hall, P. (Australian Natl. Univ., Canberra, Australia) **Australian 2,4,5-T.** *Nature (London)* 292(5821): 286; 1981 (4 references).

In this letter to the editor, a shipment of 2,4,5-T that may have been produced from fire-damaged potassium trichlorophenolate is discussed. The 2,4,5-T was found to contain 19 mg/kg TCDD on an as-received basis, and 26 mg/kg on a 2,4,5-T basis. Concern is expressed over Australia's epidemiological inquiry into Vietnam veterans' claims against 2,4,5-T. Use in Australia of 2,4,5-T with such high TCDD levels may prejudice the results for control groups in the study. Implications for civilian usage are also suggested.

81-2736. Rappe, C.; Buser, H. R.; Stalling, D. L.; Smith, L. M.; Dougherty, R. C. (Dep. Org. Chem., Univ. Umea, S-90187 Umea, Sweden) **Identification of polychlorinated dibenzofurans in environmental samples.** *Nature (London)* 292(5823): 524-526; 1981 (16 references).

The polychlorinated dibenzofurans (PCDFs) are tricyclic aromatic compounds, which in chemical and toxicological respects are very similar to polychlorinated dioxins (PCDDs). The 2,3,7,8-tetra-, 1,2,3,7,8- and 2,3,4,7,8-penta-CDFs are extremely hazardous compounds, they can be compared with the extremely toxic 2,3,7,8-tetra-CDD. PCDFs have been identified in PCBs at levels of 1-10 ppm, the major peaks being 2,3,7,8-tetra- and 2,3,4,7,8-penta-CDF. A large number of PCDFs and PCDDs occur as contaminants in chlorophenols (such as PCP), and they have also been recognized and identified in fly ash and other incineration products at the ppb-ppm level. In 1968, 1200 people in Japan were poisoned (Yusho disease) by a cooking oil contaminated by PCB and more than 50 PCDF isomers. We report here the identification of a series of PCDF isomers in samples of fat from snapping turtle (*Chelyda serpentina*) and grey seal (*Halichoerus grupus*). The analysis of PCDFs consists of 2 series of sequential chromatographic processes. (Author abstract by permission, modified)

81-2737. Sloan, M. E.; Camper, N. D. (Dep. Bot., Clemson Univ., Clemson, SC 29631) **Trifluralin effects on carrot callus tissue.** *Pestic. Biochem. Physiol.* 15(3): 201-208; 1981 (30 references).

The effect of trifluralin on oxygen consumption and on the level of adenosine phosphates and energy charge was examined in carrot callus tissue. All concentrations of trifluralin tested significantly inhibited fresh wt gain by the callus tissue. Growth at highest levels tested (10^{-4} and 10^{-5} *M*) was not different. Respiratory activity of the controls remained essentially constant during the test period. However, there was a trend toward decreased oxygen consumption with incubation time. Trifluralin at highest concentrations significantly reduced oxygen uptake compared to controls. It was concluded that carrot callus was susceptible to trifluralin. Considerable variation in responses at the molecular level was encountered, which may be related to resistance of carrots noted in the field. While oxygen consumption was impaired in treated tissue, ATP levels were not drastically affected.

81-2738. Paradies, I.; Ebert, E.; Elstner, E. F. (Inst. Bot. & Mikrobiol., Tech. Univ., D-8000 Munich 2, BRD) **Metolachlor {2-chloro-*N*-(2-ethyl-6-methylphenyl)-*N*-(methoxy-1-methylethyl) acetamide} and the metolachlor safener CGA 43089 {α-(cyanomethoximino)-benzacetonitrile} in sorghum seedlings: correlations between morphological effects and ethylene formation.** *Pestic. Biochem. Physiol.* 15(3): 209-212; 1981 (9 references).

Treatment of germinating sorghum seeds with metolachlor caused growth retardation, promoted by thickening of the first leaf and inhibition of unfolding of secondary leaves, and increased ethylene production.

Sorghum seeds pretreated with the safener CGA 43089 exhibited neither morphological deformations nor ethylene production when treated with metolachlor. Aminoethoxyvinylglycine, a specific inhibitor of ethylene formation in higher plants, decreased ethylene formation by metolachlor-treated sorghum seedlings. However, the observed deformations remained unchanged. Sorghum control seedlings grown against a covering plate built up ethylene concentrations as after herbicide treatment, but without induction of the morphological symptoms. These findings suggest that the plant hormone ethylene is a symptom and not the inducer of the morphological effects that occur after metolachlor treatment of sorghum seedlings.

81-2739. Vishunavat, K.; Shukla, P. (Dep. Plant Pathol., Chandra Shekar Azad Univ. Agric. & Technol., Kanpur, India) **Effect of seed treatment of lentil upon germination, plant stand and yield.** *Pesticides* 15(2): 15-16; 1981 (3 references).

The effects of Bavistin (carbendazim), Benlate (benomyl), Plantvax (oxycarboxin), Vitavax (carboxin), Dithane M-45 (mancozeb), thiram, Aretan (2-methoxyethylmercury chloride), Agrosan GN (phenylmercury acetate), Ceresan dry, captan and Brassicol (quintozene) on germination, plant stand, and yield of lentil were studied in field tests using randomized block design. The best germination, plant stand, and yield occurred in crops treated with Bavistin, followed by thiram and captan. In general, some improvement in yield was observed by seed treatment with most of the compounds studied. Minimum yield occurred in seeds treated with Vitavax, with yield averages below control levels.

81-2740. Marshall, E. (Author address not given) **Man versus Medfly: some tactical blunders.** *Science* 213(4506): 417-418; 1981.

The Mediterranean fruit fly (Medfly) has become a problem in California since fertile female fruit flies were discovered in orchards of Mountain View, near San Francisco. The larvae of this fly attacks 200 varieties of fruits and vegetables, and may pass through 1 generation (egg, larva, pupa, fly) in about 1 month. Under pressure from the federal government, Governor Brown ordered the spraying of malathion on the crops to prevent the spread of the Medfly throughout the state and the country. Aerial spraying of a mixture of a feeding medium and malathion was begun over a 120 square mile area (310 km²). The EPA has endorsed the spray program, and contends that this pesticide will do little harm to the environment and will not injure the health of area residents.

81-2741. Marx, J. L. (Author address not given) **Malathion threat debunked.** *Science* 213(4507): 526-527; 1981.

Controversy concerning the use of malathion in California for control of the Mediterranean fruit fly (Medfly) is discussed. Malathion is considered to be the safest organophosphate insecticide known; it is not readily absorbed through the skin, and the oral LD50 for rats is 885 mg/kg body wt. It is suggested that risks of application will be minimized by the application procedure. The procedure will deliver about 1 mg of the agent/ft² (1 mg/0.093 m²) to an area of 140 mi² (363.6 km²) around San Francisco Bay. The spray particles will be large and contain a protein derivative that serves as bait for the Medflies. This protein will cause the particles to congeal as they fall, which will minimize the risk of inhalation. The short half-life of malathion is presented as another safety factor. The potential long term effects of malathion are also considered. Reports of possible teratogenic, mutagenic, and carcinogenic effects are discussed. It is concluded that the evidence does not demonstrate teratogenicity, mutagenicity, or carcinogenicity for malathion. If the malathion spray program does not successfully control the Medfly, fumigation of crops with ethylene dibromide will probably be conducted. Ethylene dibromide has been found to be spermotoxic, mutagenic, and teratogenic.

81-2742. Byers, J. A.; Wood, D. L. (Dep. Entomol. Sci., Univ. California, Berkeley, CA 94720) **Antibiotic-induced inhibition of pheromone synthesis in a bark beetle.** *Science* 213(4509): 763-764; 1981 (14 references).

Ingestion of diet containing streptomycin inhibited the conversion of myrcene, a host plant terpene, to the male-specific pheromones ipsenol and ipsidenol in *Ips paraconfusus*. Synthesis of *cis*-verbenol, which is not a sex-specific pheromone, from the host plant terpene (−)-*α*-pinene and other metabolites from these 2 terpenes was not inhibited by the antibiotic. (Author abstract by permission. Copyright 1981 by the American Association for the Advancement of Science)

81-2743. Pojasek, R. B., ed. (Energy Resour. Co. Inc., Cambridge, MA) **Toxic and Hazardous Waste Disposal. Options for Stabilization/Solidification.** (Ann Arbor Sci. Publ. Inc.: Ann Arbor): 2: 259 pp.; 1979.

The second volume in the Toxic and Hazardous Waste Disposal Series is presented. This volume concerns stabilization/solidification processes; an evaluation of their use is included. Information is presented by which the use of a particular process for a specific waste can be evaluated. Topics of discussion include legislative initiatives, development of disposal site criteria, testing of disposal systems, and testing of industrial sludge, the disposal of arsenic-containing wastes, and studies on the fixation of Kepone (chlordecone)-contaminated sediments. Abstracts of chapters from this book will appear in the appropriate sections of this issue of *Pesticides Abstracts*.

81-2744. Swift, L. L.; Gasiewicz, T. A.; Dunn, G. D.; Soule, P. D.; Neal, R. A. (Dep. Pathol., Biochem. & Med., Sch. Med., Vanderbilt Univ., Nashville, TN 37232) **Characterization of the hyperlipidemia in guinea pigs induced by 2,3,7,8-tetrachlorodibenzo- *p*-dioxin.** *Toxicol. Appl. Pharmacol.* 59(3): 489-499; 1981 (43 references).

Treatment of adult male guinea pigs with a single dose of 2,3,7,8-tetrachlorodibenzo- *p*-dioxin (TCDD), a contaminant in the synthesis of 2,4,5-T and related herbicides, 6.2 nmol (2.0 μg/kg body wt) induces a marked hyperlipidemia characterized by a 19-fold increase in very low density lipoproteins (VLDL) and a 4-fold increase in low-density lipoproteins (LDL) compared to pair-fed control animals. VLDL from TCDD-treated animals were similar in size and electrophoretic mobility to VLDL from pair-fed control animals, but they contained less cholesteryl ester and an altered pattern of C apoproteins on sodium dodecyl sulfate-polyacrylamide gels. LDL from TCDD-treated animals were larger than LDL from pair-fed controls and contained more phospholipid and less protein than LDL from pair-fed control animals. In addition, LDL from TCDD-treated animals contained increased amounts of apoprotein C as determined by sodium dodecyl sulfate-polyacrylamide gel electrophoresis. No change in the concentration or properties of serum high-density lipoproteins was observed. Serum free fatty acids, triglycerides, and cholesteryl esters from TCDD-treated animals were enriched in linoleic acid (18:2), a principal fatty acid of adipose tissue. This suggests that mobilization of adipose tissue fatty acids in TCDD-treated animals may lead to increased hepatic lipoprotein production. However, wt-paired control animals did not become hyperlipidemic. Thus, in addition to mobilizing adipose tissue fatty acids, TCDD may alter the relative rates of anabolic and/or catabolic processes controlling serum VLDL and LDL concentrations in the guinea pig. (Author abstract by permission, modified)

81-2745. Yoshihara, S.; Nagata, K.; Yoshimura, H.*; Kuroki, H.; Masuda, Y. (Fac. Pharm. Sci., Kyushu Univ., Fukuoka 812, Japan) **Inductive effect on hepatic enzymes and acute toxicity of individual polychlorinated dibenzofuran congeners in rats.** *Toxicol. Appl. Pharmacol.* 59(3): 580-588; 1981 (29 references).

Toxicological assessment of 13 individual polychlorinated dibenzofurans (PCDFs), known contaminants of PCP, with varying chlorine substitutions was made in young male Wistar rats. All 9 congeners that had at least 3 chlorine atoms in the ring positions at 2, 3, 7 and 8, exhibited a typical 3-methylcholanthrene (MC)-type induction, i.e., a marked increase in activity of aryl hydrocarbon hydroxylase (AHH) and DT-diaphorase in the liver. The most potent congeners were 2,3,7,8-tetrachlorodibenzofuran (TCDF) and 2,3,4,7,8-pentachlorodibenzofuran (PCDF), both of which significantly induced the AHH and DT-diaphorase even at a single dose of 1 μg/kg. The congeners with 2 or less chlorine atoms such as 2,8-dichlorodibenzofuran, did not show any inductive effect on these hepatic enzymes at the single dose of 5 or 10 mg/kg. All the MC-type PDFs except for 1,2,7,8-TCDF caused a markedly atrophy of the thymus and a hypertrophy of the liver in rats, while no toxic signs were observed in animals treated with the congeners lacking the MC-type inducing ability. The ranking of toxic potencies of the MC-type PCDFs coincided well with their inducing abilities. The hepatic disposition of the congeners varied markedely. Results clearly indicate that the acute toxicity of PCDF congeners is well correlated with their MC-type inducibility, but not with their hepatic distribution. (Author abstract by permission, modified)

81-2746. Nau, H.; Bass, R. (Inst. Toxikol. & Embryonal-Pharmakol., Freie Univ. Berlin, D-1000 Berlin 33, FRG) **Transfer of 2,3,7,8-tetrachlorodibenzo- *p*-dioxin (TCDD) to the mouse embryo and fetus.** *Toxicology* 20(4): 299-308; 1981 (27 references).

TCDD, a toxic contaminant of the herbicide, 2,4,5-T, was administered to pregnant mice, and was found in the embryo and fetus between gestational days 11 and 18 at levels between 0.04 and 0.14% of the maternal dose/g tissue. The tissue levels of TCDD found in embryos on days 9 and 10 exceeded the levels found during later gestational stages. TCDD levels in fetal livers were 2-4 times higher than those in other fetal organs. The maternal liver contained the highest concentrations of TCDD, accounting for 4-10% of the dose/g tissue. Placenta and other extrahepatic maternal organs exhibited TCDD levels ~ 1, and embryos and fetuses ~ 2, orders of magnitude lower than maternal liver concentrations. A good correlation was found between the doses applied (5, 12.5, and 25 μg/kg) and the tissue levels observed. A single dose of 25 μg/kg on day 10, or 5 doses of 5 μg/kg given 1 dose/day from days 7-11, resulted in higher levels of TCDD in embryos on day 13 than did a single dose of 25 μg/kg on day 7. Cleft palate was induced at different rates by these treatment schedules.

81-2747. Hemphill, D. D., ed. (Environ. Trace Subst. Res. Cent., Univ. Missouri, Columbia, MO) **Trace substances in environmental health.** (Univ. Missouri: Columbia, MO): 13: 508 pp.; 1979.

Papers presented at the 13th Annual Conference on Trace Substances in Environmental Health in 1979 sponsored by the University of Missouri are published. Topics include population studies, environmental geochemistry and health, analytical methodology, environmental pollution, and health effects of trace substances. Among the trace metals studied were selenium, arsenic, cadmium, zinc, mercury, copper, manganese, magnesium, calcium, and phosphorus. Studies were conducted in humans, animals, and plants. One study examined the fate of the herbicide MSMA in microcosms. Abstracts of papers from this proceedings appear in the appropriate sections of this issue of *Pesticides Abstracts.*

81-2748. Anonymous (Sch. For. Res., Life Sci. & Agric. Exp. Stn., Univ. Maine, Orono, ME 04469) **Proceedings of the 14th Annual Northeastern Forest Insect Work Conference.** *Univ. Maine Orono Misc. Rep.* 242: 10pp.; 1981.

The proceedings of the 14th Annual Northeastern Forest Insect Work Conference, 24-25 February, 1981, are presented. The moderators and key speakers are listed, and an abbreviated synopsis of each workshop is provided. Workshops were conducted on hardwood insects, tree genetics, photography, softwood insects, and environmental monitoring. The environmental monitoring workshop included discussions of several aspects of insecticide impact on non-target biota, and the direct effects on individuals (acute and chronic toxicity and cholinesterase inhibition). Sublethal effects, such as behavior, growth and energetics of fish, and viral enhancement were also included. Other topics were mortality and natality rates; rate of dispersal and recolonization; local extinction of animal populations; composition, abundance, diversity of key species; biomass accumulation; and turnover rates in ecosystems.

81-2749. Dubitskii, A. M.; Saubenova, O. G.; Cherkashin, A. N. (Author address not given) **Novyi effektivnyi biologicheskii patogen dlya bor'by s komarami. [New effective biological pathogens for controlling mosquitoes.]** *Vest. Akad. Nauk Kaz. SSR* (5): 38-43; 1981 (6 references) (Russian).

The effect of *Bacillus thuringiensis* (serotype 14) on various species of *Aedes*, *Culex*, *Anopheles*, and *Culiseta* was studied. On the average, a dose of 347×10^3 bacterial cells/ml of water caused 100% death of *Culex*, *Aedes*, and *Anopheles* larvae. Preliminary tests showed that *B. thuringiensis* is harmless to humans and warm-blooded animals, and, at the doses used, to beneficial members of a biocenosis.

81-2750. Spiridonov, Yu. Ya.; Shestakov, V. G.; Metveeb, Yu. M.; Vavilov, Yu. I. (All-Union Res. Inst. Phytopathol., Moscow, USSR) **Sorbtsiya gerbitsidov osnovnymi komponentami pochvy: Soobshchenie 3. Vliyanie vlazhnosti, temperatury i kontsentratsii kationov metallov na sorbtsiyu piklorama pochvoi. [Herbicide sorption by the main soil components. 3. Effect of moisture, temperature and concentration of metal cations on the sorption of picloram by soil.]** *Agrokhimiya* (5): 120-125; 1981 (7 references) (Russian).

Picloram sorption decreased with an increase in soil moisture. Only a relatively high concentration of metal cations in the soil suspension may somewhat increase the amount of sorbed picloram. At elevated temperatures the level of picloram sorption decreased. Calculated thermodynamic characteristics of the picloram sorption process in soddy-podzolic, chernozem, and krasnozem soils indicated that the interaction of the herbicide with soil proceeds according to the physical type of sorption.

81-2751. Khegai, T. A.; Rachinskii, V. V.; Fokin, A. D. (Timiryazev Agric. Acad., Moscow, USSR) **Radioindikatornoe issledovanie povedeniya geksakhlorana y pochve. [Radioindicator studies on the behavior of hexachloran in soil.]** *Agrokhimiya* (5): 126-128; 1981 (2 references) (Russian).

The radioactive indicator method was used to study the disappearance of 1-^{14}C-hexachloran (BHC) in sterilized and nonsterilized soddy-podzolic topsoil. Disappearance of labeled hexachloran occurred mainly through evaporation. Microbiological decomposition to CO_2 was negligible.

81-2752. Geluso, K. N.; Altenbach, J. S.; Wilson, D. E. (Dep. Biol., Univ. Nebraska, Omaha, NE 68182) **Organochlorine residues in young Mexican free-tailed bats from several roosts.** *Am. Mid. Nat.* 105(2): 249-257; 1981 (25 references).

Studies were conducted to determine the levels of organochlorine pesticide contamination in bats *(Tadarida brasiliensis mexicano).* Bats were collected from Eddy Co., NM; Comal Co., TX; Greenlee Co., AZ; and Merced Co., CA. The brain and carcass of each animal were weighed prior to extraction and analysis by electron-capture gas chromatography. Levels of DDE were always higher than any other chemical, and ranged from 3 to 300 ppm; DDE was the only compound found in every specimen. In frequency of occurrence, DDT ranked 2nd, dieldrin 3rd, and DDD (TDE) 4th. Other compounds detected were dieldrin, endrin, toxaphene, and the PCB Arochlor 1260. The highest concentrations were found in bats collected in NM; the levels were fairly constant over 4 yr and were high enough to be hazardous to the bats.

81-2753. Calvet, R.; Terce, M.; Arvieu, J. C. (Stn. Sci. Sol, Cent. Natl. Rech. Agron., INRA, F-78000 Versailles, France) **Mise au point bibliographique. Adsorption des pesticides par les sols et leurs constituants. IV. Consequences des phenomenes d'adsorption. [Literature review. Adsorption of pesticides by soils and their constituents. IV. Consequences of adsorption phenomena.]** *Ann. Agron.* 31(4): 385-411; 1980 (77 references) (French).

The effects of adsorption-desorption of pesticides to soils and their components on pesticide decomposition and biocidal activity are discussed. Generally, adsorption promotes abiotic, and inhibits biological, decomposition of pesticides; adsorbent surface acidity, the nature of exchangeable cations, and dehydrated systems affect the degree of abiotic decomposition. Soil solution concentration and partial pressure of pesticides are a function of adsorption and influence soil transport of pesticides. Generally, adsorption inhibits ground water contamination, but available experimental evidence is scarce. While there is no quantitative evidence of inhibition of biocidal activity of pesticides due to adsorption because of lack of reliable methodology, the phenomenon nevertheless is demonstrable. Adsorption has consequences for determining application rates, persistence in soil and residue extraction accuracy from soils.

81-2754. Calvet, R.; Terce, M.; Arvieu, J. C. (Stn. Rech. Sol., Cent. Natl. Rech. Agron., INRA, F-78000 Versailles, France) **Mise an point bibliographique. Adsorption des pesticides par les sols et leurs constituants. V. Les methodes d'etude de l'adsorption. [Literature review. Adsorption of pesticides by soils and their constituents. V. Methods of adsorption study.]** *Ann. Agron.* 31(4): 413-427; 1980 (31 references) (French).

Methods of studying pesticide adsorption to soils and their constituents are discussed. Experiments have revealed that treating adsorbents (such as acidification or dehydration) before measurement will result in a distortion of adsorption properties of soil colloids. No convenient method exists to explain and quantify adsorption-desorption phenomena in natural media; only adsorbent-pesticide systems can be studied by spectroscopic analysis and X-ray diffraction methods. Most available information concerns pesticides adsorbed by smectites, identifying bonds between pesticide molecules and adsorbents at their interface, and chemical transformations of adsorbed molecules.

81-2755. Hunt, T. W.; Leidy, R. B.; Sheets, T. J.; Duncan, H. E. (Pestic. Residue Res. Lab., North Carolina State Univ., Raleigh, NC 27607) **Residues of ethoprop in eight vegetables.** *Bull. Environ. Contam. Toxicol.* 27(1): 84-89; 1981 (7 references).

Ethoprop was applied at rates of 3.4, 6.7, and 13.4 kg/ha to a Dothan loamy sand with a pH of 5.7, and 0.5%

organic matter. The nematocide was spread uniformly by hand over the soil and incorporated with a powered garden tiller. Half of each plot was treated on July 9. On July 13, one row of snap bean was planted and one row of tomato transplanted in the treated portion of these plots. The other half of each plot was treated on August 20. One row each of turnip, radish, lettuce, and onion was planted in these halves of the plots on the same day. Residues found in all tomato, cucumber, and lettuce samples taken were below the low detectable limit of 0.005 ppm. Highest residues were found in the radish. Turnip leaves contained the second highest ethoprop residues; levels above the detectable limit were found in 2 samples from the 6.7 and all samples from the 13.4 kg/ha treated plots. A chromatographic cleanup procedure was developed for analysis which eliminated interfering coextractives. Samples were blended in *n*-hexane with granular anhydrous sodium sulfate and rinsed with *n*-hexane and diethyl ether in petroleum ether. Acetone in *n*-hexane was added to the column, allowed to pass through, and collected. The sample was concentrated by distillation. Gas chromatographic analysis was done with a flame ionization detector. Recovery from 29 fortified samples ranged from 71 to 112%, with an average of 95%.

81-2756. Tu, C. M. (Res. Cent., Agric. Canada, London, Ontario N6A 5B7, Canada) **Effects of some pesticides on enzyme activities in an organic soil.** *Bull. Environ. Contam. Toxicol.* 27(1): 109-114; 1981 (24 references).

The activities of 3 enzymes (dehydrogenase, phosphatase, and urease) in an organic soil were studied after treatment of the soil samples with 32 insecticides, fungicides, and herbicides. After 2 wk, increased dehydrogenase and urease activities were noted in control soils. With the exception of vorlex, all fumigants inhibited dehydrogenase activity after 1 wk. Formazan formation was significantly increased after 2 wk with numerous pesticides. The release of *p*-nitrophenol indicated phosphatase activity, and was used as an index of soil organic phosphate decomposition by microflora. Many pesticide treatments reduced the release of *p*-nitrophenol. With the exception of triazophos, all treatments inhibited urease activity at 10 μg/g after the first wk of application.

81-2757. Jackson, M. D.; Lewis, R. G. (Health Eff. Res. Lab., US EPA, Research Triangle Park, NC 27711) **Insecticide concentrations in air after application of pest control strips.** *Bull. Environ. Contam. Toxicol.* 27(1): 122-125; 1981 (5 references).

Pest control strips containing a 10% concentration of propoxur, diazinon, or chlorpyrifos were applied in a room according to manufacturer's directions. Air exchanges (8-10/hr) were made through a single inlet and single outlet in the ceiling. Thirty-six steps were placed in the room, 18 at floor level and at 1 m above the floor on the wall at ~ 0.75 m intervals. All 3 pest control strips emitted vapors into the atmosphere. The highest air concentrations were < 0.8, 1.4, and 0.26 μg/m³ for propoxur, diazinon, and chlorpyrifos, respectively. A sharp drop on day 4 for propoxur was not explained. Maximum room levels were reached in 7 to 15 days. There were no characteristic odors of insecticides in the rooms.

81-2758. Foerstner, U. (Inst. Sedimentforschung, Univ. Heidelberg, Heidelberg, BRD) **Inorganic pollutants, particularly heavy metals in estuaries.** In: *Chemistry and Biogeochemistry of Estuaries.* Olausson, E. and Cato I., eds. (John Wiley & Sons Ltd.: Chichester): CH10: 308-348; 1980 (184 references).

The distribution of inorganic pollutants in estuaries is reviewed, with emphasis on heavy metals and artificial radioactive isotopes. Five major sources of inorganic pollutants are discussed, including the use of metals and metal compounds, such as copper, as plant protection agents. Other topics include the use of water, sediment, and organism analyses to assess pollution levels; waste disposal in estuaries, including ocean disposal of dredge materials, sewage sludge, and nuclear wastes; pollution by artificial radionucleotides and trace metals; and the bioaccumulation of inorganic pollutants.

81-2759. Reutergardh, L. (Natl. Swedish Envir. Prot. Board, Spec. Anal. Lab., Univ. Stockholm, Sweden) **Chlorinated hydrocarbons in estuaries.** In: *Chemistry and Biogeochemistry of Estuaries.* Olaussen, E. and Cato I., eds. (John Wiley & Sons Ltd.: Chichester): CH11: 349-365; 1980 (86 references).

The influence of chlorinated organic pollutants on estuaries is discussed, with emphasis on substances that persist in the environment through bioaccumulation. The organochlorine compounds found in estuaries can generally be divided into pesticides and industrial chemicals. Toxicity to aquatic organisms, effects on various trophic levels, transport mechanisms, distribution, and accumulation of the following compounds are discussed: DDT, chlordane, cyclodienes (aldrin, dieldrin, endrin), lindane, toxaphene, hexachlorobenzene, and mirex. DDT uptake and degradation are discussed in detail as an example. It is concluded that more research must be carried out before the full impact of organochlorine compounds on the estuarine environment can be understood.

81-2760. de Kreuk, J. F.; Hanstveit, A. O. (Div. Technol. Soc. TNO, Delft, The Netherlands) **Determination of the biodegradability of the organic fraction of chemical wastes.** *Chemosphere* 10(6): 561-573; 1981 (2 references).

The determination of biodegradability of the

organic fraction of chemical wastes is discussed. One problem is the proper application of laboratory findings to events in the natural environment. Standardized methods can not be used for biodegradation studies; DOC reduction, O_2 uptake, or CO_2 evolution alone do not give conclusive results. However, bioassays in combination with analytical fingerprints do provide sufficient information on biodegradation. Another problem is that most biodegradation experiments are carried out in freshwater, and the possibility exists that results differ in seawater. Data on chlorophenols (including PCP) indicate that in some cases freshwater data may overestimate degradation in the marine environment. There are several important factors that must be studied before the problems of determining biodegradation can be fully resolved: the effect of frequent reinoculation on the reproducibility of tests; co-metabolism at environmental concentrations with natural substrates; degradation of compounds found in low concentrations; and the effects of temperature on biodegradation.

81-2761. Hermann, B. W. (Univ. California, Davis, CA) **Atmospheric residues of the defoliants DEF, Folex, and their sulfur-containing byproducts near treated cotton fields.** *Diss. Abstr. Int. B* 41(11): 4104; 1981.

Two of the formulation components and possible metabolites of both Def and merphos are 1-butane thiol (BuSH) and N-dibutyl disulfide (BuSSBu). Atmospheric levels of BuSH and BuSSBu were determined in relation to the formulation used, the time from treatment to sampling, and the distance from application to the sampling site. These studies showed merphos to be oxidized rapidly to Def with the simultaneous production of mercaptan. Def was non-polar and stable under environmental conditions. Environmental modeling confirmed these conclusions. Def and merphos were applied to cotton foliage in a laboratory chamber and the air sampled for several days following application. Though both formulations originally contained < 0.1% BuSH, it was the major atmospheric residue during the first 2 days after the merphos application and was never detected in the Def application samples. Air sampling of the commercial application was done with solid adsorbents, using a combination of HiVol (lm^3/min) and LoVol (40L/min) air samplers. The commercial application showed decreasing concentrations of all 3 formulation components over time. Some samples did not increase late in the sampling period (3-4 days), probably due to atmospheric inversions. A comparison of the atmospheric residues from Def and merphos applications once again show a much higher level of BuSH from the merphos application. The levels (tr-1321 ng/m^3 Def, 0-27 ng/m^3 BuSSBu, and 0-1576 ng/m^3 BuSH) are not high enough to cause the illnesses reported, but may be responsible for psychologically-induced illnesses due to the malodorous BuSH and the current public mistrust of chemicals. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 8105385)

81-2762. Haque, R. (Off. Res. & Dev., US EPA, Washington, DC 20460) **Dynamics, exposure and hazard assessment of toxic chemicals in the environment: an introduction.** In: *Dynamics, Exposure and Hazard Assessment of Toxic Chemicals.* Haque R., ed. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH01: 1-3; 1980.

The persistence and bioaccumulation of mercury, polychlorinated biphenyls, Kepone (chlordecone), and dioxin are examples of the adverse effects that result from the increased production and use of chemicals. The development of a credible technology of risk assessment and the evaluation of toxic substances in a cost-effective manner are important in today's economy and safety conscious society. Transport and fate data play key roles in defining the exposure concentration of chemicals in the environment. The full potential of fate and transport studies in the development of predictive techniques for exposure estimation of chemicals and in defining the potential hazards is discussed.

81-2763. Blair, E. H. (Dow Chem. Co., Midland, MI 48640) **A role of transport and fate studies in industrial decision making for toxic chemicals.** In: *Dynamics, Exposure and Hazard Assessment of Toxic Chemicals.* Haque, R., ed. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH02: 5-13; 1980.

The role of transport and fate studies in industrial decision-making about toxic chemicals is reviewed. Some of the events that lead from product development to marketing of an industrial chemical are described, with particular emphasis on the broader aspects of safety to the public, to the manufacturer, and to those who handle the product. Sound data and technologies that are reliable and reproducible are essential to evey aspect of decision making. Constant evaluation of the health and environmental aspects of the product is a continuing part of the process. The manufacturing site and the customers who will use the product are considered. Transport phenomena and environmental fate of the chemical are crucial areas to study. When a new chemical is synthesized or a new formulation developed, the processing stages are as follows: a biological activity screening program is run to find any unusual biological activity possessed by the chemical/formulation; mammalian toxicological range-finding tests are done; data from these early tests are used to predict the potential effects from short-term human exposure, and to aid in designing additional tests; and environmental testing is done. Information is given regarding ethylene oxide to illustrate the use of transport and fate data in the decision-making process.

81-2764. Riordan, C. (Off. Res. & Dev., US EPA, Washington, DC 20460) **Toxic chemical transport and fate research in U.S. Environmental Protection Agency.** In: *Dynamics, Exposure and Hazard Assessment of Toxic Chemicals.* Haque, R., ed. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH04: 21-26; 1980.

Substantive and programmatic concerns of EPA research programs in the area of transport and fate research are highlighted. A small research program in the transport and fate of pesticides was to be initiated in direct support of the Federal Insecticide, Fungicide, and Rodenticide Act in early 1980. The funding of the research program is tied to congressional authorities, and the Office of Research and Development has to defend its research program in media-ranking exercises. The contribution of each research project to the larger mission of the organization must be demonstrated. To survive this scrutiny, a program must clearly establish its value to the operating arm of the agency. One current program is to develop exposure assessment techniques for pesticides in the food chain and in freshwater and estuarine environments.

81-2765. Haque, R.; Falco, J.; Cohen, S.; Riodan, C. (Off. Res. & Dev., US EPA, Washington, DC 20460) **Role of transport and fate studies in the exposure, assessment and screening of toxic chemicals.** In: *Dynamics, Exposure and Hazard Assessment of Toxic Chemicals.* Haque, R., ed. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH08: 47-67; 1980 (54 references).

The principles of transport and fate studies in the development of predictive exposure techniques are reviewed. The elements that affect transport and fate are the physicochemical properties of the chemical transport processes in the environment, and the parameters of transformation processes. There are key physicochemical properties of a toxic chemical, such as a pesticide, that affect behavior of the chemical in air, water, soil/sediment, and biota; these properties include solubility, volatility, vapor pressure, structural characteristics, and partition coefficient. Exposure concentration can be estimated if the following information can be determined: source of the chemical, including discharge or emission rate; transport and transformation characteristics, which are needed to define major environmental pathways; and definition of the population at risk. Models for exposure assessment use transport parameters, physicochemical properties, and degradation rate constants to predict concentrations in soil, air, water, and biota. Various models are reviewed. Two approaches, Benchmark and Structure Activity, may be used to screen new chemicals. One makes predictions based on the class of the chemical; the other is based on chemical properties as a function of its substituent groups.

81-2766. Zepp, R. G. (Environ. Res. Lab., Off. Res. & Dev., US EPA, Athens, GA 30605) **Assessing the photochemistry of organic pollutants in aquatic environments.** In: *Dynamics, Exposure and Hazard Assessment of Toxic Chemicals.* Haque, R., ed. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH09: 69-110; 1980 (87 references).

Processes that influence rates of photochemical transformations of aquatic pollutants such as PCBs and insecticides are discussed. There are 2 types of photochemical processes. Direct photolysis involves light absorption by the chemical itself. Indirect or sensitized photolysis is initiated through light absorption by other substances in the system; a study of photoreactivity of disulfoton and aldrin in natural waters is cited. Data on photochemical reactivities of other pesticides are also cited. Rate expressions that describe photochemical transformation are given. Other topics include simulation of solar spectral irradiance reaching the surface of water bodies, light attenuation and mixing in natural waters, and the effects of sorption on photolysis in natural water. Atmospheric photolysis of volatile water pollutants, and computer simulations that assess the role of photolysis in aquatic environments, are briefly examined.

81-2767. Dilling, W. L.; Goersch, H. K. (Environ. Sci. Res. Lab., Dow Chem. Co., Midland, MI 48640) **Organic photochemistry, XVI. Tropospheric photodecomposition of methylene chloride.** In: *Dynamics, Exposure and Hazard Assessment of Toxic Chemicals.* Haque, R., ed. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH10: 111-126; 1980 (25 references).

Methods for determining the rates of photodecomposition of compounds in the troposphere are described, and problems associated with these measurements are discussed. Methylene chloride is used as a specific example. Anomalous decomposition reactions under simulated tropospheric conditions and decomposition products formed under simulated tropospheric conditions are discussed. The half-life of methylene chloride in the troposphere is 40-120 days. Little of the chemical escapes from the northern troposphere. Major tropospheric photodecomposition products are carbon dioxide and hydrochloric acid. Simulated tropospheric photodecomposition reactions of methylene chloride are subject to surface effects; findings suggest that care should be taken in interpreting the results of such simulation studies. Surface effects must taken into account in determining gas-phase tropospheric decomposition rates. Because solid and liquid surfaces on particulate matter and aerosols are present in the troposphere, surface reactions could play a role in the decomposition of organic compounds in the troposphere.

81-2768. Mackay, D.; Shiu, W. Y.; Sutherland, R. J. (Dep. Chem. Eng. & Appl. Chem., Univ. Toronto, Toronto, Ontario M5S 1A4, Canada) **Estimating volatilization and water column diffusion rates of hydrophobic contaminants.** In: *Dynamics, Exposure and Hazard Assessment of Toxic Chemicals.* Haque, R., ed. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH11: 127-142; 1980 (7 references).

This chapter examines the mechanism of volatilization of hydrophobic contaminants, presents mathematical

expressions that describe the volatilization processes, identifies the major uncertainties in the predictive procedure, and describes and suggests laboratory and field techniques for obtaining the required data. Specific topics discussed include the mechanism of air-water exchange; the conventional 2-resistance approach; the fugacity approach as it pertains to the vapor phase, the water phase, and the sorbed phase; the calculation of mass flux; the role of suspended solids in water column transport; sorption-desorption kinetics; and the application to water column transport. By assigning resistances in consistent units to various compartments and regions of transport resistance, the overall calculation of transport rate becomes considerably simpler and the dominant resistances can be readily identified. It is suggested that progress toward understanding the environmental dynamics of toxic substances can only be made by taking measurements from the environment and interpreting them with some physically reasonable, quantitative model of environmental processes.

81-2769. Spencer, W. F.; Farmer, W. J. (Dep. Soil & Environ. Sci., SEA, USDA, Univ. California, Riverside, CA 92521) **Assessment of the vapor behavior of toxic organic chemicals.** In: *Dynamics, Exposure and Hazard Assessment of Toxic Chemicals.* Haque, R., ed. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH12: 143-161; 1980 (41 references).

The transfer of toxic organic chemicals into the atmosphere, the mechanisms involved, factors influencing rates of vapor transfer, and procedures for determining vapor pressure and vapor loss rates are discussed. Data on vapor pressure and vaporization rates of dieldrin under different conditions are compared. Similar data are cited for other pesticides. The importance or reliable values for physicochemical properties is emphasized in developing predictive models for fate of the chemical in the environment. Information is presented on vapor loss rates from surface deposits, from soil-incorporated chemicals, and from simulated landfills in laboratory and field studies to demonstrate the importance of volatilization in the dissipation of chemicals from solid and liquid surfaces. Vaporization and atmospheric transport of pesticides is emphasized.

81-2770. Wolfe, N. L. (Environ. Res. Lab., Off. Res. & Dev., US EPA, Athens, GA 30605) **Determining the role of hydrolysis in the fate of organics in natural waters.** In: *Dynamics, Exposure and Hazard Assessment of Toxic Chemicals.* Haque, R., ed. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH13: 163-178; 1980 (50 references).

To estimate the role of hydrolysis in the fate of organic pollutants in natural waters, rate constants and concentration effects of reactants for each mechanism must be determined. The rate constant can sometimes be determined from linear free energy relationships (LFER), which are used as tools to predict bioconcentration factors, sediment-sorption partition coefficients, octanol/water partition coefficients, and toxicity to aquatic organisms. Topics discussed include hydrolysis rate data, hydrolysis in natural waters, field studies, natural water samples, metal catalysis, and use of LFERs. Studies of hydrolysis of pesticides are cited as examples.

81-2771. Alexander, M. (Lab. Soil Microbiol., Dep. Agron., Cornell Univ., Ithaca, NY 14853) **Biodegradation of toxic chemicals in water and soil.** In: *Dynamics, Exposure and Hazard Assessment of Toxic Chemicals.* Haque, R., ed. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH14: 179-190; 1980 (17 references).

Investigations on the microbial transformations of toxic and other organic molecules, particularly pesticides, in natural waters and soil are reviewed. Microbial transformations occur in the case of phenoxy herbicides. In some cases activation occurs, and a nontoxic molecule is converted to a toxic one. In other cases, defusing results when a potentially hazardous substance is converted to a nontoxic one. Assessments of biodegradation are typically performed using models of natural ecosystems. The process of activation is being examined more and more as a critical feature of insecticide toxicity. Only recently has evidence been gathered that activation may occur as a direct or indirect result of microbial action in water and soil. The formation of 2,4-D from the corresponding butyrate, the methylation of arsenicals to yield trimethylarsine, and the microbial role in the formation of nitrosamines in the environment are all examples of activation.

81-2772. Weber, W. J., Jr.; Sherrill, J. D.; Pirbazari, M.; Uchrin, C. G.; Lo, T. Y. (Environ. & Water Resour. Eng., Dep. Civil Eng. Univ. Michigan, Ann Arbor, MI 48109) **Transport and differential accumulation of toxic substances in river-harbor-lake systems.** In: *Dynamics, Exposure and Hazard Assessment of Toxic Chemicals.* Haque, R., ed. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH15: 191-213; 1980 (14 references).

A multifaceted investigation of the association of chlorinated hydrocarbons, including organochlorine insecticides, with suspended solids in aquatic environments is cited. The study includes development of a comprehensive mathematical model for simulation and prediction of the distribution and differential accumulation of suspended solids and associated pollutants in river-lake and river-estuary systems. Results that have been gathered to delineate and quantify sorption-desorption equilibria are presented. Kinetics for association of a model toxic compound, Aroclor 1254, on suspended solids and bottom sediments are calculated. A parallel investigation of the physical characteristics and settling dynamics of these solids is described, and a brief theoretical description is offered of the overall system model currently being developed.

81-2773. Khan, S. U. (Chem. & Biol. Res. Inst., Res. Branch, Agric. Canada, Ottawa, Ontario, Canada) **Role of humic substances in predicting fate and transport of pollutants in the environment.** In: *Dynamics, Exposure and Hazard Assessment of Toxic Chemicals.* Haque, R., ed. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH16: 215-230; 1980 (19 references).

Background information is provided on humic substances, and the role of humic substances in determining the transport and fate of toxic chemicals in the environment is discussed. Humic substances comprise 3 fractions: humic acid (HA), which is soluble in dilute alkali but is precipitated on acidification on the alkaline extract; fulvic acid (FA), which is the humic fraction that remains in solution when alkaline extract is acidified, and humin, which is the humic fraction that cannot be extracted from the soil or sediment by dilute base or acid. Humic materials can attack and degrade soil minerals by complexing and dissolving metals and transporting them within soils and waters. The ability of humic materials to complex common heavy metals may reduce the immediate toxic impact and increase the eventual accumulation of toxic substances in organisms, with long-term consequences. Evidence suggests that humic substances can solubilize organic compounds that are otherwise water-insoluble, and so modify their behavior and activity. Included among these are dialkyl phthalates and DDT. Evidence also suggests that pesticides can form stable complexes with humic substances, thus increasing their persistence in soil and aquatic environments. Humic substances can also promote the nonbiological degradation of many pesticides.

81-2774. Gillett, J. W. (Corvallis Environ. Res. Lab., US EPA, Corvalis, Oregon 97330) **Terrestrial microcosm technology in assessing fate, transport and effects of toxic chemicals.** In: *Dynamics, Exposure and Hazard Assessment of Toxic Chemicals.* Haque, R., ed. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH17: 231-249; 1980 (22 references).

A wide variety of laboratory-model ecosystems or microcosms have been developed to study the transport and effects of pesticides, toxic substances, and pollutants in general. Several of these systems are reviewed, including aquatic/terrestrial model ecosystems, soil core microcosms, plant/soil microcosms, a modified plant/soil/water modular microcosm, a physical model ecosystem, microagroecosystems, the CERL terrestrial microcosm chamber, and a soil/litter ecosystem respirometer. Advantages and disadvantages of the microcosm approach are discussed. Many of the systems which have been constructed have been largely for the purpose of examining pesticides, with an emphasis in the natural or intact systems. Microcosm technology has been applied to the 3 main processes of chemical disposition: transport, transformation, and bioaccumulation. Each microsystem used must be designed to test specific hypothesis about chemical fate and toxic effects.

81-2775. Neely, W. B. (Environ. Sci. Res., Dow Chem. Co., Midland, MI 48640) **A method for selecting the most appropriate environmental experiments on a new chemical.** In: *Dynamics, Exposure and Hazard Assessment of Toxic Chemicals.* Haque, R., ed. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH20: 287-296; 1980 (14 references).

A technique that estimates the distribution of a chemical in the air, water, and soil is presented. By comparing this profile with the intended use pattern for the chemical, decisions can be made on what action is needed to ensure proper safety. This model is designed for assessing environmental as opposed to human health hazards. Several case studies are presented using existing products such as Kepone (chlordecone), mirex and chlorpyrifos. A profile generated from the physical properties of Kepone suggests the types of problems that can be associated with the distribution of such a chemical in an aquatic system. These problems include a potential for bioconcentration and a great affinity for soil and water. The profile suggests that more testing is needed in the areas of degradative mechanisms. A profile of mirex, combined with additional test results, shows a high persistence level, with bioconcentration. Had such a profile been generated prior to the accidents which have occurred with this chemical, the need for additional knowledge concerning biodegradation rates in water and soil and acute and chronic effects on various organisms would have been determined. The profile on chlorpyrifos suggests problems similar to those encountered with Kepone. Degradation studies are needed.

81-2776. Mill, T. (SRI Int., Menlo Park, CA 94025) **Data needed to predict the environmental fate of organic chemicals.** In: *Dynamics, Exposure and Hazard Assessment of Toxic Chemicals.* Haque, R., ed. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH21: 297-322; 1980 (48 references).

Kinetic data from laboratory tests can be used to evaluate dynamic environmental processes by establishing quantitative relationships that couple kinetic properties of chemicals with kinetic properties of the environment and its biological populations. Fate tests can be used to predict how rapidly and where a chemical will move in the environment, how rapidly and to what it will be transformed, and how long it will persist at what concentrations. Predictive methodology used for assessing fate of a given chemical is described. Kinetic and equilibrium rate processes, specific fate processes, and data needs for fate assessment are considered. Specific measurement methods and predictive methodology are given for photochemical reactions, oxidation, hydrolysis, biodegradation, volatilization, and the sorption of chemicals to sediment and soil. Sample data for methyl parathion are presented.

81-2777. Eschenroeder, A.; Irvine, E.; Lloyd, A.; Tashima, C.; Tran, K. (Arthur D. Little Inc., Cambridge,

MA 02140) **Computer simulation models for assessment of toxic substances.** In: *Dynamics, Exposure and Hazard Assessment of Toxic Chemicals*. Haque, R., ed. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH22: 323-368; 1980 (35 references).

Results of a preliminary study of the problems associated with the transport and ultimate fate of toxic chemicals are presented, and the sensitivity of this transport to various parameters in the ecosystem is discussed. Information on the concentrations of DDT in the environment is presented as a sample case, chemical properties, production level, sources, metabolites, and toxicity data are reviewed. Discrepancies in the published literature about DDT are discussed. Modeling formulations for movement of chemicals in the environment are reviewed. Chemical and biological aspects to be considered in assessing the movement of chemicals through the environment are discussed. Governing equations and their solution are reviewed. Models of acute and chronic toxic effects are presented. A section on specific chronic effects illustrates simulation of respiratory damage and feeding damage functions. Several manifestations of lethal toxic effects or combined damage effects are discussed, and the interaction of normal fluctuations in a population with those due to a toxic chemical are considered. Future research directions and suggested refinements of the model are discussed.

81-2778. El Beit, I. O. D.; Wheelock, J. V.; Cotton, D. E. (Crop Prot. Dep., Ahmadu Bellow Univ., Zaria, Nigeria) **Factors affecting soil residues of dieldrin, endosulfan, γ-HCH, dimethoate, and Pyrolan.** *Ecotoxicol. Environ. Saf.* 5(2): 135-160; 1981 (100 references).

Factors that affect soil residues of several pesticides are reviewed. A variety of routes by which pesticides are lost from soils are discussed, as are the chemical physical conditions of pesticides and soils which affect loss from soils. The primary pathways of loss from soil are leaching, adsorption, degradation, volatilization, and codistillation. Characteristics of pesticides that affect loss include water solubility, vapor pressure, polarity, molecular structure, and the concentration and formulation of the compound. Important characteristics of soil are organic matter and clay content, soil microorganisms, pH, mineral content, temperature and soil moisture content. The pathways of loss and dangers expected from applying dieldrin, endosulfan, γ-HCH (lindane), dimethoate and Pyrolan are discussed.

81-2779. Liu, D.; Strachan, W. M. J.; Thomson, K.; Kwasniewska, K. (Environ. Contam. Div., Natl. Water Res. Inst., Canada Cent. Inland Waters, Burlington, Ontario L7R 4A6, Canada) **Determination of the biodegradability of organic compounds.** *Environ. Sci. Technol.* 15(7): 788-793; 1981 (17 references).

A standard procedure and a new apparatus for determining the relative biodegradability of both water-soluble and -insoluble organic compounds under various laboratory environmental conditions has been developed. The degradation test system is based on the measurement of the primary biodegradation rates of such substances in cyclone fermenters under aerobic and anaerobic conditions, with and without cometabolites. The degradation is accomplished with a mixture of microorganisms from activated sludge, soil, and sediments, and abiotic processes are corrected for by the use of controls. Fenitrothion and 2,4-D were tested in the system. The former was found to be more readily degraded under anaerobic cometabolism conditions (T1/2 = 1.0 day) than when the same system was aerobic (T1/2 = 5.5 days); when fenitrothion was the sole carbon source (metabolism), its stability was greater still, especially under aerobic conditions. The herbicide 2,4-D was easily degraded under aerobic conditions (T1/2 = 1.8 and 3.1 days for cometabolism and metabolism, respectively); however, under anaerobic conditions, its degradation rate was greatly decreased (T1/2 = 69 and 135 days, respectively) to the point where the rates were comparable to those of abiotic processes. The precision of the test system was checked with aniline and found to be ± 32% relative standard deviation on T1/2 = 0.21 day for aerobic cometabolism. (Author abstract reprinted by permission of the American Chemical Society)

81-2780. Stiles, G. C. (Author address not given) **Danger: poison in the well!** *Ground Water Age* 15(9): 23-24; 1981.

The discovery of arsenic at various levels in the water of residential wells in southern New Hampshire and northern Massachusetts is reported. Various theories as to the source of the arsenic have been proposed. Insecticides and herbicides have been suggested as a possible source. Evidence for this comes from the fact that contaminated wells often occur near power lines, where rights-of-way have been cleared with herbicides for years. In addition, some contaminated wells are on the sites of old apple orchards and crop lands, where herbicides have been used heavily in the past. Some experts contend that no particular pattern to the contaminated areas exists, and it is noted that arsenic occurs naturally in this area. The question of safe levels of arsenic is also in dispute. EPA states that the safe level in water is 50 ppb. However, some well water has been shown to contain up to 350 ppm with no illnesses reported in users. The question of the arsenic source remains to be answered, as does determination of what constitutes a dangerous level of arsenic.

81-2781. Thakur, A. K.; Hameed, S. F. (Himachal Pradesh Krishi Vishwa Vidylaya, Palampur, Himachal Pradesh 176062, India) **Harvest residues of some organophosphorous insecticides on apple.** *Indian J. Agric. Sci.* 50(10): 778-780; 1980 (12 references).

Residue levels of several insecticides on apples following spraying were determined. Diazinon, fenitrothion, methyl parathion, malathion and phosalone were applied at a rate of 5 *l* of 0.5% solution/tree. The residues ranged from below detectable limits to 0.954 ppm. All residues were lower than the acceptable tolerance limits.

81-2782. Roosels, D.; Van Den Oever, R.; Lahaye, D. (Fund Occup. Dis., Sterrenkundelaan 1, B-1030 Brussels, Belgium) **Dangerous concentrations of methyl bromide used as a fumigant in Belgian greenhouses.** *Int. Arch. Occup. Environ. Health* 48(3): 243-250; 1981 (23 references).

Studies on atmospheric levels of methyl bromide (MB) resulting from treatment of greenhouse soils are presented. Injection and fumigation techniques were employed. The levels of MB in the air were determined by gas chromatography during and after application. Concentrations during the injection procedures varied from 100 to 1000 ppm. Preventive measures (deeper injections, plastic foil covering, sprinkling with water) reduced airborne levels. During fumigation techniques, concentrations remained between 100 and 1000 ppm. Variations in equipment and application techniques resulted in the variations in airborne concentrations.

81-2783. Draper, W. M.5; Crosby, D. G. (Dep. Anim. Dairy & Vet. Sci., Utah State Univ., Logan, UT 84322) **Hydrogen peroxide and hydroxyl radical: intermediates in indirect photolysis reactions in water.** *J. Agric. Food Chem.* 29(4): 699-702; 1981 (22 references).

Thiobencarb (benthiocarb; I) photodecomposes slowly to thiobencarb S-oxide (II) in aqueous solutions exposed to sunlight. The rate of photodecomposition of I in water was greatly increased by addition of small amounts of hydrogen peroxide, tryptophan, or methylene blue. In these solutions, 2-hydroxythiobencarb (III), 3-hydroxythiobencarb (V), II, and N-monoethylthiobencarb (IV) were isolated as photooxidation products of I; the distributions of these products were similar in each case. Thiobencarb did not undergo reaction with photochemically generated, singlet molecular oxygen but was oxidized by hydroxyl radical (Fenton's reagent) to III, V, and II. The free radical photooxidation of I in aqueous acetone was unique; II and IV were among the photoproducts but the phenols, III and V, were absent. These results demonstrate the involvement and common intermediacy of hydrogen peroxide and hydroxyl radical in indirect photolysis reactions in aqueous solutions of hydrogen peroxide, tryptophan, and methylene blue. (Author abstract reprinted by permission of the American Chemical Society)

81-2784. Ruzo, L. O.; Casida, J. E. (Pestic. Chem. & Toxicol. Lab., Dep. Entomol. Sci., Univ. California, Berkeley, CA 94720) **Pyrethroid photochemistry: (*S*)-α-cyano- 3-phenoxybenzyl *cis*-(1*R*,3*R*, 1′*R* or *S*)-3-(1′2,′-dibromo-2′,2′-dihaloethyl)-2,2-dimethylcyclopropanecarboxylates.** *J. Agric. Food Chem.* 29(4): 702-706; 1981 (16 references).

The cis-(1*R*,3*R*,1′*R* or *S*)-1′,2′-dibromo-2′,2′-dihaloethyl)-2,2- dimethylcyclopropanecarboxylates, tralomethrin and tralocythrin (Roussel-Uclaf, proposed common names), readily debrominate when solutions or thin films are irradiated at 360 nm or by sunlight. Debromination results from homolytic cleavage of a carbon-bromine bond, followed by collapse of the resulting trihaloethyl radical to the dihaloalkene. Effects of various hydrogen donors and of triethylamine on the reaction rate and product distribution suggest that bromine is not produced from a concerted process. Dehydrobromination, 1*R*,*cis* goes to 1*RS*,*cis*,*trans* isomerization, and ester cleavage are also significant photochemical reactions of tralomethrin and tralocythrin in the solid phase whereas only the first 2 of these processes are important with irradiated solutions. The reactions of tralomethrin in solution are sensitized by triplet donors but the excited state responsible for debromination is not established. (Author abstract reprinted by permission of the American Chemical Society)

81-2785. Acher, A. J.; Saltzman, S.; Brates, N.; Dunkelblum, E. (Div. Soil Residues Chem., Inst. Soils & Water, Bet Dagan, Israel) **Photosensitized decomposition of terbacil in aqueous solutions.** *J. Agric. Food Chem.* 29(4): 707-711; 1981 (13 references).

The dye-sensitized photolysis of aerated aqueous solutions of terbacil (3-*tert*-5-chloro-6-methyluracil, I) exposed to solar irradiation was investigated under different reaction conditions. After 2 hr of exposure to sunlight, in the presence of methylene blue (3 ppm) or riboflavin (10 ppm), the major photodegradation product in the pH range of 3.0-9.2 was 3-*tert*-butyl-5-hydroxyhydantion (II). In alkaline reaction mixtures (pH 8.0 or 9.2), this product undergoes deacylation, giving 3-*tert*-5-hydroxylhydantoin (III). In experiments carried out under neutral or acidic conditions (pH 6.8 or 3.0) with riboflavin, 2 additional products were isolated: a mono-N-dealkylated terbacil dimer (IV) and a nonidentified water-insoluble product (V). The structures of II, III, and IV were determined by using proton and carbon-13-nuclear magnetic resonance, infrared, ultraviolet, and mass spectroscopy. (Author abstract reprinted by permission of the American Chemical Society)

81-2786. Umetsu, N.; Nishioka, T.; Fukuto, T. R.* (Div. Toxicol. & Physiol., Dep. Entomol., Univ. California, Riverside, CA 92521) **Acid-catalyzed alteration of 2,3-dihydro-2,2-dimethyl-7-benzofuranyl (di-*n*-butylaminosulfenyl) methylcarbamate via nitrogensulfur bond cleavage. Formation of polysulfide derivatives.** *J. Agric. Food*

Chem. 29(4): 711-715; 1981 (8 references).

A new experimental insecticide, 2,3-dihydro-2,2-dimethyl-7-benzofuranyl (di-*n*-butylaminosulfenyl) - methylcarbamate (DBSC), was unstable in acidic media, e.g., dichloromethane-acetic acid (9:1), and was converted into a number of alteration products via N-S bond cleavage. The principal products were carbofuran, dibutylamine, a mixture of polysulfide derivatives of DBSC (I), biscarbofuran *N,-N'*-disulfide (III), and a mixture of biscarbofuran *N,N'*-polysulfides (IV), the structures being confirmed by MS and NMR analyses of purified products. I and IV, which were indicated to be a mixture of polysulfide derivatives, gave single spots on silica gel thin-layer plates with several different solvent systems. The rates of acid-catalyzed alteration of DBSC and formation of carbofuran, dibutylamine, I, III, and IV were determined by using [*carbonyl*-^{14}C]- or [*dibutylamino*-^{14}C]DBSC. The rate of DBSC decomposition was first order in DBSC. (Author abstract reprinted by permission of the American Chemical Society)

81-2787. Getzin, L. W. (West. Wastington Res. & Ext. Cent., Puyallup, WA 98371) **Degradation of chlorpyrifos in soil: influence of autoclaving, soil moisture, and temperature.** *J. Econ. Entomol.* 74(2): 158-162; 1981 (16 references).

The decomposition of ^{14}C-ring-labeled chlorpyrifos was followed in 2 soils for a 32-wk period under laboratory conditions at 25°C. Time required for 50% loss of parent compound in Chehalis clay loam and Sultan silt loam was 4 and 12 wk, respectively. Faster breakdown of the insecticide in the clay loam was due to microbial degradation since initial half-lives of 24 wk were observed in both autoclaved soils. Radioactivity from degraded chlorpyrifos was recovered as 3,5,6-trichloro-2-pyridinol, as expired CO_2, and as a nonextractable soil-bound residue component. After 32 wk, 47% of the radioactivity from degraded insecticide were recovered as CO_2 in the clay loam as compared to only 8% in the silt loam. Temperature had a pronounced effect on the decay rate of chlorpyrifos in Sultan silt loam during a 24-wk incubation period at 15°C, 25°C, and 35°C; initial half-lives were 25, 13, and 6 wk, respectively. Soil moisture contents ranging from 3-20% did not affect insecticide degradation rates in the Sultan silt loam. (Author abstract by permission)

81-2788. Nandakumar, N. V.; Rajendrababu, S.; Udayabhaskar, S.; Swami, K. S. (Dep. Zool., Sri Vendateswara Univ., Tirupati, India) **Survey of pesticide residue analysis in paddy straw samples from some farms of Chittoor District of Andhra Pradesh.** *J. Food Sci. Technol.* 18(1): 33-34; 1981 (7 references).

Dried rice paddy straw from 36 farms in the Chittoor District of Andhra Pradesh, India, were analyzed for pesticide residues by gas liquid chromatography and colorimetry. Levels of BHC, methyl parathion, fenitrothion, and dimethoate as high as 6, 1.8, 1.96, and 2.36 ppm, respectively, were detected in rice straw from some of the farms. In several instances, methyl parathion concentrations exceeded the recommended international standards. These findings warrant more careful application and monitoring of pesticides in rice paddy fields.

81-2789. Frank, R.; Thomas, R. L.; Braun, H. E.; Gross, D. L.; Davies, T. T. (Prov. Pestic. Residue Test. Lab., Ontario Minist. Agric. Food, Guelph, Ontario N1G 2W1, Canada) **Organochlorine insecticides and PCB in surficial sediments of Lake Michigan (1975).** *J. Great Lakes Res.* 7(1): 42-50; 1981 (18 references).

A study was designed to map the concentration of organochlorine insecticides and PCBs in the upper 3 cm of the bottom sediment of Lake Michigan. Using a Shipek bottom sampler, samples were collected from 286 sites arranged in a grid pattern. Samples were extracted with hexane:acetone, cleaned up on a Florisil column, and analyzed by chromatographic methods. DDT was found in 93.4% of the samples; the mean residue for ΣDDT was 11.9 ng/g. Dieldrin was found in 48.3% of the samples, the mean residue level was 0.25 ± 0.43 ng/g. Chlordane was identified in only 21.6% of the sediments, the mean level was 0.37 ± 0.88 ng/g. Heptachlor epoxide was present in 53.9% of the samples, the mean residue level was 0.67% ± 1.03 ng/g. PCB occurred in 79.6% of the samples at an average concentration of 9.7 ng/g. Of the 52 samples analyzed for mirex, none showed detectable levels of the compound. No residues of endosulfan, endrin, or methoxychlor were detected. Residues were 2-4 times higher in depositional zones than in non-depositional zones.

81-2790. Duttachowdhury, S. R.; Ghose, J. L.; Lonsane, B. K.; Raghavan, K. V.; Sandhu, J. S. (Cent. Food Technol. Res. Inst., Mysore, India) **Pollution through pesticide plants—treatment and control.** *J. Sci. Ind. Res.* 40(2): 125-131; 1981 (22 references).

A review of analysis and monitoring techniques and control methods for pesticide residues in manufacturing plant wastes is presented. Effluents from pesticide plants may be broadly classified as organophosphates, organochlorines, carbamates, phenoxy acids and their related compounds, and inorganics. Gas and liquid chromatographic methods and IR spectral analysis of liquid and gaseous plant emissions are recommended for the monitoring of pesticidal wastes. The physical, biological and chemical procedures available for the treatment of pesticide-containing effluents are discussed. Activated carbon treatment for aldrin, dieldrin, endrin, DDT and toxaphene residues in waste waters has been employed. Incineration is sometimes useful in removing atmospheric pollutants and in the destruction of solid pesticide wastes. Some biological detoxification techniques using microbial

degradation of pesticides are considered. Disposal methods for solid waste pesticides and their containers usually employ incineration techniques. Some safety recommendations are made for plants engaged in treatment of pesticidal wastes.

81-2791. Belova, T. V. (Inst. Soil Sci. Agrochem., Acad. Sci. Uzbek, USSR) **Vliyanie gerbitsidov na soderzhanie azotistykh soedinenii v svetlom serozeme. [Effect of herbicides on the content of nitrogenous compounds in light sierozem.]** *Khim. Sel'sk. Khoz.* 19(5): 26-27; 1981 (6 references).

The effect of herbicides on the content of nitrogenous compounds in soil under cotton was determined. Cotoran (fluometuron; 1 kg/ha), prometryne (2 kg/ha), and Cotofor (dipropetryn; 1.3 kg/ha with respect to the preparation) were applied. Soil samples were taken 2, 15, and 50 days after application. The free amino acid nitrogen content in a soil layer 0-30 cm varied from 2.18-3.35 mg/kg. The pattern of changes in amine nitrogen content was similar in character. At 2 days the highest amino acid and amine nitrogen concentrations in soil were in the prometryne sample (25.16 and 3.35 mg/kg, respectively); the lowest concentrations were in the control sample (18.61 and 2.37 mg/kg, respectively). In subsequent periods, the highest free amino acid and amine nitrogen concentrations were found in the Cotoran sample (23.15 and 2.95 mg/kg), and the lowest in the control (19.2 and 2.51 mg/kg). Thus, application of these herbicides does not have a significant effect on the nitrogen content of light sierozem during the first 50 days after application.

81-2792. Chkanikov, D. I.; Makeev, A. M.; Pavlova, N. N. (All-Union Res. Inst. Phytopathol., USSR) **Opredelenie ostatkov 2,4-D v solome i zerne zlakovykh rastenii. [Determination of 2,4-D residues in straw and grain of grassy plants.]** *Khim. Sel'sk. Khoz.* 19(5): 60-63; 1981 (10 references) (Russian).

Studies in straw and grain of spring wheat containing labeled 2,4-D showed that when crops were treated with the herbicide at the recommended time, grain and straw contained appreciable quantities of 2,4-D. The 2,4-D concentration in these parts of the plant increased when application was later. The largest quantities of 2,4-D were present in the lower stalk.

81-2793. Frommer, R. L.; Hembree, S. C.; Nelson, J. H.; Remington, M. P.; Gibbs, P. H. (US Army Med. Bioeng. Res. & Dev. Lab., Fort Detrick, Frederick, MD 21701) **The distribution of *Bacillus thuringiensis* var. *israelensis* in flowing water with no extensive aquatic vegetative growth.** *Mosq. News* 41(2): 331-338; 1981 (10 references).

To produce effective larval mortality in *Simulium vittatum* in laboratory and field studies, the concentration of *Bacillus thuringiensis* must remain at a certain level for a specified length of time. The effects of flowing water on the maintenance of certain levels of this microbial control agent were tested in an effluent stream flowing from an Army ammunition plant in Tennessee. A level of 50-80% of the desired treatment concentration of the bacterium (3.10 ppm) was maintained for 20-22 min in the stream after application. Peak recovery of the agent occurred midway through a 35 min exposure period when a 312 m section of stream was treated. At 24-48 hr post-treatment, only background levels of *B. thuringiensis* remained in the waters.

81-2794 Stritzler, R.; Felderman, E. J.; Sasso, L. A.; Stockdale, D. K.; Thomas, D. B.; Schlam, J. F.; Vianna, N. (Author address not given) **Some aspects of chemical contamination of drinking water.** *N. Y. State J. Med.* 81(4): 563-564; 1981.

The problems of drinking water contamination by chemicals in the 1980s are considered. Main sources of drinking water supply pollution are leakage from landfills, infiltration from road salts, storm water recharge containing land and street washings, sewer leakage, commercial discharges, fertilizers and pesticides. Nitrate pollution comes from lawn and agricultural fertilizers, storm water recharge, and cesspool and field sewage disposal systems. Organic chemical pollutants come mostly from industrial sources, pesticides, and household products. The contamination of wells in Suffolk County by Temik (aldicarb) is mentioned. This nematocide was applied at rates as high as 2 lb/acre (2.26 kg/ha). Some of the questions surrounding the Temik incident are discussed. Many of the unanswered questions will need consideration by state officials, the public and the Department of Health.

81-2795. Donkin, P.; Mann, S. V.; Hamilton, E. I. (Nat. Environ. Res. Counc., Inst. Mar. Environ. Res., Plymouth P11 3DH, England) **Polychlorinated biphenyl, DDT and dieldrin residues in grey seal *(Halichoerus crypus)* males, females and mother-foetus pairs sampled at the Farne Islands, England, during the breeding season.** *Sci. Total Environ.* 19(2): 121-142; 1981 (66 references).

Blubber-lipids of grey seals *(Halichoerus grypus)* were analyzed for residues of organochlorine pesticides and total non-polar organohalogen residues after the 1972 breeding season. Total organohalogen residues were negatively correlated with the thickness of the blubber and

positively correlated with age. The mean blubber organohalogen concentration of the males was significantly greater than that of the females. Significant correlations were found between PCB and DDT group residue concentrations. Transplacental movement of organochlorines was demonstrated by detection of PCB, DDT, DDE and dieldrin in the livers of mother/fetus pairs. The effects of seal condition at breeding time and the health of the seal population on the residues of these compounds were considered.

81-2796. Cutshall, N. H.; Larsen, I. L.; Nichols, M. M. (Environ. Sci. Div., Oak Ridge Natl. Lab., Oak Ridge, TN 37830) **Man-made radionuclides confirm rapid burial of Kepone in James River sediments.** *Science* 213(4506): 440-442; 1981 (7 references).

Profiles on man-made radionuclides in sediment cores from the James River estuary confirm the rapid burial of the pesticide Kepone (chlordecone). The greatest deposition of Kepone has occurred in zones characterized by very high sedimentation rates, 10 to 20 cm/yr. Since sediment is the major Kepone reservoir, rapid burial probably reduces the exposure of organisms to further contamination. Disturbance caused by hurricanes or dredging, however, could return highly contaminated sediment to the surface although this sediment would be diluted with less contaminated particles. (Author abstract by permission. Copyright 1981 by the American Association for the Advancement of Science)

81-2797. Guard, H. E.; Cobet, A. B.; Coleman, W. M., III (Naval Biosci. Lab., Sch. Public Health, Univ. California, Berkeley, CA 94720) **Methylation of trimethyltin compounds by estuarine sediments.** *Science* 213(4509): 770-771; 1981 (14 references).

Both biologically active and autoclaved sediments convert trimethyltin hydroxide to the volatile tetramethyltin. Larger amounts of tetramethyltin were formed in the bioactive sediments than in the sterile sediments. No volatile tin compounds were detected in the absence of trimethyltin hydroxide or from trimethyltin hydroxide in seawater or in seawater containing bentonite. The formation of tetramethyltin is slow, taking over 80 days at 16°C to reach a maximum. The extent of conversion, although significant, is not extensive. The formation of tetramethyltin occurs in estuarine sediments by both abiotic and biologically enhanced pathways. A redistribution mechanism accounts for at least the abiotic pathway and possibly both formation pathways. (Author abstract by permission. Copyright 1981 by the American Association for the Advancement of Science)

81-2798. Hasset, J. J.; Banwart, W. L.; Wood, S. G.; Means, J. C. (Univ. Illinois, Urbana, IL 61901) **Sorption of α-napthol: implications concerning the limits of hydrophobic sorption.** *Soil Sci. Soc. Am. J.* 45(1): 38-42; 1981 (20 references).

The influence of soil and sediment properties on the sorption of 3 compounds with divergent polarities and structures were evaluated. The compounds studied were α-naphthol, 3-methylcholanthrene, and the herbicide dicamba. Soil thin-layer chromatography plates were spotted with the 3 test compounds, and R_f values were determined. In a pure water system α-naphthol and 3-methylcholanthrene were strongly hydrophobically adsorbed, with R_f values close to zero. Dicamba, a polar and water-soluble compound, had an R_f value close to 1.0. Increasing percentages of ethanol resulted in higher R_f values for α-naphthol and 3-methylcholanthrene. R_f values for dicamba decreased with increased percentage ethanol; at 100% ethanol the R_f value was < 0.15. Dicamba is concluded to be solvophobic; it is a hydrophilic molecular, and is absorbed only at high ethanol concentrations.

81-2799. Anderson, A. C.; Abdelghani, A. A.; McDonell, D.; Mason, J. W. (Dep. Environ. Health Sci., Tulane Univ., New Orleans, LA) **Fate of the herbicide MSMA in microcosms.** In: *Trace Substances in Environmental Health*. Hemphill, D. D., ed. (Univ. Missouri: Columbia): 13: 274-284; 1979 (10 references).

A model microcosm was designed consisting of soil and water components. Two wk before dosing, 30 crawfish and 30 sailfin mollies were added to each microcosm. Grass stands in microcosms were first sprayed at the nominal field application rate of 4 lb MSMA/acre (4.5 kg/ha). However, the actual field application rate approached 9 kg/ha; additional microcosms were dosed at this concentration. Movements of the herbicide MSMA through the components of the model ecosystem closely followed the patterns of compartmentalization seen in field trials. Agreement was best for water and sediment concentrations over time and for the patterns of accumulation in grass and crawfish. Little agreement was obtained between field and microcosm soil data, but this can be explained by differences in soil architecture and methods of application of the herbicide. It was concluded that microcosms appear to be useful aids in screening studies to determine the distribution of compounds in the biotic and abiotic compartments of the ecosystem and to evaluate inter-species or community effects.

81-2800. Thomas, W. (Lehrstuhl Hydrologie, Univ. Bayreuth, Bayreuth, BRD) **Monitoring organic and inorganic trace substances by epiphytic mosses – a regional pattern of air pollution.** In: *Trace Substances in Environmental Health*. Hemphill, D. D., ed. (Univ. Missouri: Columbia): 13: 285-289; 1979 (7 references).

During the fall of 1978, 8-10-g samples of moss *Hypnum cupressiforme* were collected at each of 37 sampling sites lying along a profile extending from the Alps in southeastern West Germany northwest to the Netherlands coast. Trace metals were determined in the moss as well as selected organic substances of environmental relevance. The aerial pattern of contaminant concentrations determined correlated highly with various sources of air pollution. The aerial pattern for lindane was quite distinct. The highest values, up to 65 μg/kg, of lindane in moss occurred in samples collected in areas of intense agricultural land use. Principal loadings of this pesticide in the air occurred in areas exhibiting intensive fruit and vegetable farming both in West Germany and in the Netherlands. In contrast, pasture lands were characterized by relatively low pesticide concentrations. The overriding influence of climate must be considered in these findings.

81-2801. Tiberio, R. D.; Emmi, F.; McDuffie, B. (Lab. Trace Methods & Environ. Anal., SUNY-Binghamton, Binghamton, NY) **Behavior of heavy metals and organic pollutants in the conversion of soils to river sediments – a model experiment.** In: *Trace Substances in Environmental Health*. Hemphill, D. D., ed. (Univ. Missouri: Columbia): 13: 296-303; 1979 (12 references).

Soil composite samples were prepared for each of 3 areas the Susquehanna River Basin in New York state. Synthetic river water was used to wash the soil samples in a procedure designed to simulate the natural production of river sediment. In the resulting prepared sediments, heavy metal concentrations were generally 10-40% lower than those in the original soil samples for both sand and silt/clay fractions, with the exception of copper. Organic pollutants in general remained at about the same concentration after the soil-sediment conversion process was completed. Some changes in organic carbon and cation exchange capacity were noted. Both heavy metal and organic pollutant concentrations in the resulting prepared sediments were similar to those of actual river sediments for sites upstream from the Binghamton area. The 3 soil composites had comparable levels of chlorinated hydrocarbon pesticides; conversion to sediments did not appreciably affect these concentrations. DDT type pesticides were relatively high in soil samples (2-12 ng/g), perhaps due to earlier agricultural usage. Heptachlor was present in all soil samples and in 2 prepared sediments. Lindane was found in trace amounts in 1 soil sample and in all 3 prepared sediments. Aldrin, heptachlor epoxide, and dieldrin were not found.

81-2802. Lieberman, M. T.; Alexander, M. (Dep. Agron., Cornell Univ., Ithaca, NY 14853) **Microbial degradation of pesticides.** *US NTIS AD Rep.* AD-A092, 594/1: 17 pp.; 1980 (25 references).

The toxicity of pesticides to nitrification was assessed by measuring the effect of low concentrations of pesticides on nitrate formation. Of the 8 pesticides tried, only 14 μg/ml carbaryl exerted a detrimental influence in generation time of sewage-derived nitrifers as determined from the logarithmic rates of nitrate formation with and without pesticides. Other carbamates, Baygon (propoxur) and Ficam (benthiocarb), and the herbicide 2,4-D had no effect at either 1.4 or 14 μg/ml. Four organophosphate insecticides [malathion, diazinon, Dursban (chlorpyrifos), and dichlorvos] stimulated nitrification at a concentration of 10 μg/ml but they had no effect at 1 μg/ml. Previous studies of the toxicity of these pesticides were concluded. Experiments using the BOD assay to confirm previous results were performed. The results show that 6 of the 8 chemicals did not affect oxygen consumption by a sewage inoculum at concentrations of 0.1 to 100 μg/ml of active ingredient. Baygon at 10 and 100 μg/ml and Ficam at 1 and 10 μg/ml showed some toxicity. The BOD method was also used to test the biodegradation of the pesticides and each chemical was supplied as a sole carbon source. Enrichments were obtained able to deplete O_2 at the expense of carbaryl, Ficam, malathion, and diazinon, but Baygon, dichlorvos, and 2,4-D were resistant to breakdown as tested by this procedure. (Author abstract by permission)

81-2803. Farmer, W. J.; Yang, M. S.; Letey, J.; Spencer, W. F. (Dep. Soil & Environ. Sci., California Univ., Riverside, CA) **Land disposal of hexachlorobenzene wastes controlling vapor movement in soil.** *US NTIS PB Rep.* PB80-216,575: 82 pp.; 1980 (34 references).

Hexachlorobenzene (HCB) is a persistent, fat-soluble organic compound of low aqueous solubility present in some industrial wastes. Transport in water moving through soil will be negligible but its long term persistence and appreciable vapor pressure allows significant volatilization to occur. Conditions for soil covers that would control the movement of HCB out of landfills and other disposal/storage facilities into the surrounding atmosphere were studied. The volatilization fluxes of HCB from industrial wastes (hex wastes) were determined in a simulated landfill under controlled laboratory conditions. Coverings of water and soil were found to be highly efficient in reducing volatilization. Polyethylene film was less efficient when compared on a cost basis. Volatilization flux through a soil cover was directly related to soil air-filled porosity and was greatly reduced by increased soil compaction and water content. An organic liquid phase associated with the hex waste was heavier than water and contained 1.4% HCB by weight. The presence of HCB in this liquid phase creates the potential for rapid transport of HCB in porous media. A procedure is proposed for using the results of this study to design a landfill cover that will limit the volatilization flux of HCB and other compounds. (Author abstract by permission)

81-2804. US EPA, Region V, Chicago, IL **Evaluation of suspected environmental contamination of the Hemlock,**

Michigan area. *US NTIS PB Rep.* PB81-112,526: 77 pp.; 1980 (46 references).

The Environmental Protection Agency conducted an investigation in the Hemlock, Michigan area to determine if a chemical contamination problem existed there. This investigation was prompted by complaints of human and animal health problems in the area, which were alleged to be due to toxicants in aquifers used for drinking water supplies. In this study ~ 90 samples, including water, soil, animal tissues, and household dust samples, were analyzed for a wide variety of parameters. Tests conducted on the samples included arsenic, cadmium, lead, bromide, chloride, PCBs, PBBs, pesticides, dioxin, and GC/MS scans for organics. No evidence of a chemical contamination problem in the Hemlock, Michigan area was found. (Author abstract by permission)

81-2805. Monnig, E.; Zweidinger, R. A.; Warner, M. (Res. Triangle Inst., Research Triangle Park, NC) **Treatability studies of pesticide manufacturing wastewaters: dazomet.** *US NTIS PB Rep.* PB81-129,033: 41 pp.; 1980 (20 references).

The report gives results of laboratory studies of the treatability of manufacturing wastewater from synthesis of the pesticide, dazomet. A tiered approach was taken: the least costly and most available treatments were investigated first. Effluent from the manufacture of dazomet was tested for treatability by activated sludge systems when diluted to 1:100, 1:500, and 1:1000 in municipal wastewater. At 1:100, dazomet showed > 95% reduction after biological treatment; however, effluent COD levels were unacceptably high at an average of 160 mg/l. At 1:500, effluent COD was much closer to the control effluent; however, nitrification of ammonia was severely hampered. At 1:1000, dazomet wastewater had a variable effect on nitrification while effluent COD levels were close to those of controls. It is recommended that dazomet wastewater be diluted to at least 1:1000 in municipal wastewater to minimize the negative effects on the nitrification of ammonia during the activated sludge treatment process. (Author abstract by permission)

81-2806. Durkin, P. R.; Howard, P. H.; Saxena, J.; Lande, S. S.; Santodonato, J. (Oak Ridge Natl. Lab., Oak Ridge, TN) **Review of the environmental effects of pollutants: X. Toxaphene.** *US NTIS PB Rep.* PB81-132,409: 498 pp.; 1979 (68 references).

The environmental effects of toxaphene are extensively reviewed. Information is presented on chemical properties and analytical techniques, environmental occurrence, cycling, and fate, as well as on food chain interactions. Biological aspects of toxaphene in microorganisms, plants, wild and domestic animals, and humans and test animals are reviewed, including metabolism, toxicity, carcinogenicity, mutagenicity, and teratogenicity. (Author abstract by permission)

See also 81-2703, 81-2708, 81-2710, 81-2711, 81-2713, 81-2719, 81-2736, 81-2741, 81-2743, 81-2747, 81-2807, 81-2809, 81-2811, 81-2812, 81-2815, 81-2816, 81-2817, 81-2821, 81-2825, 81-2826, 81-2840, 81-2841, 81-2853, 81-2872, 81-2875, 81-2876, 81-2886, 81-2887, 81-2898, 81-2905, 81-2909, 81-2970, 81-2971, 81-2975, 81-2976, 81-2977, 81-2981, 81-2995 *and* 81-2996.

81-2807. Kominsky, J. R.; Wisseman, C. L.; Morse, D. L. (Hazard Eval. & Tech. Assist. Branch, Div. Surveillance Hazard Eval. & Field Stud., NIOSH, Cincinnati, OH 45226) **Hexachlorocyclopentadiene contamination of a municipal wastewater treatment plant.** *Am. Ind. Hyg. Assoc. J.* 41(8): 552-556; 1980 (20 references).

In March, 1977, a municipal sewage treatment plant in Louisville, KY was contaminated with hexachlorocyclopentadiene (HCCPD) and related chlorinated hydrocarbons. Plant workers reported irritation of the skin and eyes, sore throat, cough, chest discomfort, headache, nausea, and fatigue. Symptoms persisted at least 6 wk in 5-18% of the workers. Health effects evaluations of 97 workers involved in decontamination procedures showed them to experience similar symptoms; 19% had at least 1 abnormal liver function test on serial blood testing. The airborne levels of HCCPD to which workers were exposed are unknown, but medical and environmental data collected during the decontamination period provides documentation of HCCPD's potential toxicity. (Author abstract by permission)

81-2808. Cripps, D.; Peters, H. A.; Gocmen, A. (Univ. Wisconsin Sch. Med., Madison, WI) **Porphyria turcica (hexachlorobenzene intoxication) twenty years later.** *Br. J. Dermatol.* 105(S19): 15; 1981.

In 1956-1958 increasing numbers of porphyria cases were found in Turkey; the cause was determined to be ingestion of seed wheat that had been treated with the fungicide, hexachlorobenzene. More than 300 Turks developed Kala Yara, a condition with features similar to porphyria cutanea tarda. Children under the age of 1 yr died with weakness, convulsions, and toxic erythema known as Pembre Yara. Since 1977, 138 patients have been examined, with a mean age at the time of porphyria of 9.5 yr. Weakness has been the most common symptom. The neurological symptoms present appeared to be those of HCB neurotoxicity, rather than acute intermittent porphyria. Quantitative measurement of HCB showed significant levels in maternal milk, with a mean of 0.27 ppm. Concentrations in the subcutaneous fat were 0.22 ppm. Patients who had developed Kala Yara 20 yr earlier are still significantly affected. It is suggested that Pembe Yara is related to transplacental and maternal milk levels of HCB.

81-2809. Davis, J. E.; Staiff, D. C.; Butler, L. C.; Stevens, E. R. (Wenatchee Pestic. Res. Branch, US EPA, Wenatchee, WA 98801) **Potential exposure to dislodgable residues after application of two formulations of methyl parathion to apple trees.** *Bull. Environ. Contam. Toxicol.* 27(1): 95-100; 1981 (10 references).

Three airblast applications of methyl parathion (MP) were made to apple trees at 1-mo intervals. The amount applied was 1.68 kg AI/ha in 3740 *l* of water. Respiratory and hand exposures were determined under conditions designed to result in maximum contact with and disturbance of residues on the apple foliage. The 2 applicators wore light cotton gloves to measure hand exposure and modified dust respirators to assess respiratory exposure. Sampling periods were 1, 2, 3, and 7 days after each of the 3 sprayings. Microencapsulated and emulsifiable concentrate formulations of MP were used. Exposures to emulsifiable concentrate on hands were 580, 330, 240, and 55 μg 1, 2, 3 and 7 days after spraying; respiratory exposures were 2.1, 3.0, 2.1, and 1.4 μg, respectively. Exposures for microencapsulated formulations were 3100, 3200, 3000, and 1000 μg on hands 1, 2, 3, and 7 days after spraying. Respiratory exposures were 12, 9.3, 7.3, and 5.0 μg. The findings indicated that comparison of the acute dermal toxicities of 2 formulations of the same spray material may not be a valid procedure for establishing a reentry time for a new formulation. The effect that the formulation will have on transfer of residues to workers must also be considered. The dislodgable residue method was shown to be a valid procedure for predicting the potential for dermal exposure to foliage residues.

81-2810. Easley, C. B.; Laughlin, J. M.; Gold, R. E.; Tupy, D. R. (Dep. Text. Clothing & Des., Univ., Nebraska, Lincoln, NB 68583) **Methyl parathion removal from denim fabrics by selected laundry procedures.** *Bull. Environ. Contam. Toxicol.* 27(1): 101-108; 1981 (7 references).

Emulsifiable concentrate (EC); encapsulated (ENC); and wettable powder (WP) formulations of methyl parathion (MP) were used to contaminate 100% cotton denim and 50%/50% cotton/polyester fabrics. Four laundry procedures were used: pre-rinse, phosphate detergent wash, phosphate detergent wash + ammonia laundry additive, and phosphate detergent wash + bleach laundry additive. These laundry procedures removed a mean of 80-99% MP. Mean percentages removed were higher for ENC and WP formulations, with 93-99% removed. EC MP removal was lower, 80-88%. Pre-rinsing was effective when fabric and formulation were considered. Fiber content of the fabric made no difference in MP removal. Of the laundry procedures used, use of ammonia additive was the least effective for MP removal. Bleach was slightly more effective than ammonia as a laundry additive. Laundering with phosphate detergent + ammonia was far less efficient than the other procedures.

81-2811. Caldwell, G. G.; Cannon, S. B.; Pratt, C. B.; Arthur, R. D. (Cent. Dis. Control, Athens, GA) **Serum pesticide levels in patients with childhood colorectal carcinoma.** *Cancer* 48(3): 774-778; 1981 (18 references).

Pesticide levels were measured in blood samples from 10 children who had mucin-producing colorectal adenocarcinomas and their families. These 10 patients who were treated between September 1974 and November 1976

in Memphis, TN, were from rural areas of the Mississippi Delta where pesticide use is high. None had a family history of colorectal cancer, familial polyposis, or ulcerative colitis. Levels of pesticide residues were not generally higher in blood samples from patients and their families than from individuals in a control population. Two of the patients had exceptionally high DDT levels, 320 and 200 ppb ΣDDT. One of these 2 had parents who also had exceptionally high DDT levels (158 and 479 ppb). A mother and sister of another patient had high dieldrin levels (26 and 24 ppb). It is suggested that further surveillance for additional cases, both from this area of pesticide usage and other areas in the United States, may be useful.

81-2812. Bardodej, Z.; Hladik, F.; Rejlkova, V.; Urban, J.; Zenata, E. (Med. Sch. Hyg., Charles Univ., Prague, Czechoslovakia) **Hodnota a pouziti exposicnich testu. XIX. Exposicni test pro bifenyl. [The value and use of exposure tests. XIX. Exposure test for biphenyl.]** *Cesk. Hyg.* 25(5): 241-251; 1980 (43 references) (Czech).

The exposure test for biphenyl and Dowtherm A-Dinyl is based on fluorimetric determination of 4-hydroxybiphenyl in urine. Urine is hydrolyzed by HCl; 4-hydroxybiphenyl is extracted with n-heptane and with 0.1 NaOH, then determined by measuring fluorescence at 407 nm, at excitation 301 nm. On the basis of medical monitoring of workers exposed to the 2 compounds in Czechoslovak polyester plants, atmospheric levels of 1 mg biphenyl or 4 mg Dowtherm A-Dinyl/m³ air were considered admissible; double these values were maximum permissible concentrations. The biphenyl level corresponds to 2.3 mg 4-hydroxybiphenyl/*l* urine during the last 4 hr of a worker's shift. Recent findings of elevated SGPT activity in workers exposed to 0.46 mg/m³ Dowtherm indicate that these levels are too high. Increased SGPT activity indicates an impact of the pollutant on the liver parenchyma of exposed individuals. It is recommended that new maximum permissible levels be set.

81-2813. Boyd, S. D.; Wasserman, G. S.; Green, V. A.; Wise, G. W.; Roberts, D.; Williams, J. (Child. Mercy Hosp., Sch. Med., Univ. Missouri, Kansas City, MO 64108) **Lead arsenate ingestion in eight children.** *Clin. Toxicol.* 18(4): 489-491; 1981 (2 references).

A case of 8 children accidentally ingesting and inhaling a 95% lead arsenate pesticide is reported. Vomiting was induced, and the patients were treated with symptomatic and supportive therapy, resulting in good recovery. The amounts ingested were apparently small, and no specific arsenic antidotal therapy was required. The most common complaint was irritability, continuing for up to 2 wk. Abdominal pain, constipation or diarrhea, and anorexia were also common. Muscle incoordination and non-productive cough were observed in some patients. Initially, blood Pb levels were slightly above the acceptable level, but decreased significantly after 2 wk. Blood arsenic levels were elevated, but far below the laboratory toxic range.

81-2814. Londono Uribe, R. (Michigan State Univ., East Lansing, MI) **Analysis of parameters to be considered in establishing pesticide maximum residue limits in Colombia.** *Diss. Abstr. Int. B* 41(12): 4376; 1981.

An analysis of the parameters to be considered in establishing pesticide maximum residue limits in Columbia and the application of them to residue limits of aldrin and dimethoate in potatoes is made. This analysis includes the study of parameters of 2 different types. The first one is those parameters which at a given moment, due to the nature of the research done internationally, could be accepted as valid for Columbia. The second one includes those variables which, due to the available infrastructure and their specific nature, must be studied under the conditions of the country. The suggested parameters to be accepted from an international level are: the methodology used by the US EPA and by FAO/WHO in establishment of maximum residue limits: the Acceptable Daily Intake (ADIs) proposed by the Joint Meeting of FAO/WHO (JMPR) and the careful study to accept or reject the International Codex Alimentarius maximum residue limit suggestions. The parameters analyzed under the Colombian conditions are legal and administrative ground work for pesticides; a compendium of studies on pesticide residues and available resources for this kind of work; per capita/-day consumption of food; average wt of the Colombian consumer; agricultural practices used in growing potatoes; field experiments and sampling that must be done; analytical techniques in residue analysis; suggestion of the maximum residue limits for aldrin and dimethoate in potatoes. This work is presented as a basic document that makes it possible to formulate a policy on pesticide residues and tolerances for Columbia on the basis of international research and discussion of the every-day Colombian community questions. (Author abstract by permission. Copies of the thesis are available from University Microfilms, order No. 8112118)

81-2815. Kimerle, R. A. (Monsanto Co., St. Louis, MO 63166) **Aquatic hazard evaluation. State of the art.** In: *Dynamics, Exposure and Hazard Assessment of Toxic Chemicals.* Haque, R., ed. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH29: 451-457; 1980 (2 references).

Some accepted principles and facts of aquatic hazard assessment are presented. Hazard assessment is performed by comparison of the toxicity of a chemical with the exposure concentration. Aquatic toxicity is determined by testing the chemical on the appropriate representatives of aquatic environments. Methods exist to estimate and/or measure the exposure concentrations of chemicals in various compartments of the aquatic environment. The ac-

quisition of data on toxic effects and environmental fate can most appropriately be done in a stepwise sequential manner or in tiers; decision criteria must be built into the tiers to provide guidance. Closer assessment of actual conditions allows more confidence in the findings. It is suggested that no subjective system of hazard assessment should be expected to replace good scientific judgement in weighing the risks with the societal benefits of the chemical. A 4-tier hazard evaluation process involving screening tests, predictive tests, confirmative tests, and monitoring studies is presented. Hazard evaluation needs are also discussed. Scenarios involving reduction of toxicity through mitigating effects of the real world and synergistic enhancement of toxicity by the real world are presented.

81-2816. Moghissi, A. A.; Marland, R. E.; Congel, F. J.; Eckerman, K. F. (Off. Res. & Dev., US EPA, Washington, DC 20460) **Methodology for environmental human exposure and health risk assessment.** In: *Dynamics, Exposure and Hazard Assessment of Toxic Chemicals.* Haque, R., ed. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH31: 471-489; 1980 (17 references).

A generalized hazard assessment methodology is presented. The kinetics of environmental toxicants, their movement in air, water, biota, and their ultimate sink in land or ocean is usually complex. In most cases, simplifying assumptions are made to predict the behavior of toxicants. To establish the toxicity of an environmental pollutant, the concentration of the toxicant ingested, inhaled, or otherwise taken into the body must be known. The impact of population exposure to a pollutant depends not only on the nature and concentration of the toxicant, but also on factors such as age, food habits, and physiological parameters of the exposed population. A toxicant released to the environment becomes involved in the physical, chemical, and biological processes occurring in that environment. A number of different exposure pathways can lead the toxicant from the environment into direct human contact.

81-2817. Jelinek, C. (FDA, Bur. Foods, Washington, DC 20204) **Occurrence and methods of control of chemical contaminants in foods.** *Environ. Health Perspect.* 39: 143-151; 1981 (29 references).

Residues of pesticides in foods or animal feed result from their use on agricultural products and or from their presence in the environment. To control pesticides in foods the EPA permits the commercial use of a pesticide only after sufficient information has been given to demonstrate that the pesticide can be used safely on the crops concerned. Surveillance for pesticides on various commodities is carried out by the states on products moving intrastate. There are currently about 280 pesticides registered by the EPA for use on food or animal feeds. The FDA presently collects and analyzes about 8500 samples of various domestic and imported agricultural commodities for pesticides and PCBs; determines pesticides, PCBs, mercury, and other contaminants in about 1200 samples of domestic and imported fish; and also examines about 750 samples of animal feeds.

81-2818. Pastushenko, T. V. (Author address not given) **Materialy po gigienicheskomu normirovaniyu metil-N-(benzimidozolil) karbamata v vozdukhe rabochei zony. [Data on the hygienic standardization of methyl-*N*-(2-benzimidazolyl) carbamate in the air of a work zone.]** *Gig. Tr. Prof. Zabol.* (5): 43-44; 1981 (Russian).

Experiments in rats, mice, guinea pigs, and rabbits showed that a methyl-*N*-(2-benzimidazolyl) carbamate (carbendazim) concentration of 5 mg/m³ was the threshold level for chronic systemic toxicity (Lim_{ch}). A concentration of 1.2 mg/m³ was the threshold level for mutagenic and gonadotoxic activity. The maximum permissible concentration in the air of a work zone in the USSR of 0.1 mg/m³ was established from these data.

81-2819. Lin, V. (West. Cent. Health Plann., San Francisco, CA) **Pesticides and rural health planning.** *HRP Rep.* HRP-0902,427/4: 13 pp.; 1980 (11 references).

Pesticides, widely used in agricultural and forestry areas, expose rural residents and workers to a wide range of hazardous substances. Many health problems caused by pesticide exposure go untreated or unrecognized due to lack of knowledge, inadequate medical care, cultural and language barriers, poor reporting of cases, and pressure from growers and pesticide users. Health systems agencies can play an important role in identifying the extent of the problem and needed services. Implementation strategies include: cooperation with other agencies studying health problems associated with pesticide use; consumer education and involvement; training of health care providers: encouragement of needed services within existing institutions; and consideration of pesticide problems during agency reviews. A bibliography, list of selected Federal offices in Regions VIII, IX and X, and other contacts for protection from pesticide poisoning are presented. (Author abstract by permission)

81-2820. Tomczak, S.; Baumann, K.*; Lehnert, G. (Ordinariat Arbeitsmed., Univ. Hamburg, D-2000 Hamburg 76, BRD) **Occupational exposure to hexachlorocyclohexane. IV. Sex hormone alterations in HCH-exposed workers.** *Int. Arch. Occup. Environ. Health* 48(3): 283-287; 1981 (18 references).

A study on occupational exposure to lindane is presented. Sixty workers at a chemical plant producing lindane were tested. Blood samples were collected and analyz-

ed for testosterone, LH and FSH. Duration of exposure in workers varied from 1 to 30 yr; mean duration of exposure was 8 yr. Serum LH levels were significantly higher than controls (8.8 mIU/ml and 5.7 mIU/ml, respectively). FSH and testosterone levels in exposed workers did not vary significantly from controls. While some effect of lindane on sex hormone regulation is indicated, further studies are necessary to determine the extent of the impact.

81-2821. Siddiqui, M. K. J.; Saxena, M. C.; Mishra, U. K.; Krishna Murti, C. R.; Nag, D. (Ind. Toxicol. Res. Cent., Lucknow 226001, India) **Long-term occupational exposure to DDT.** *Int. Arch. Occup. Environ. Health* 48(3): 301-308; 1981 (22 references).

Studies were conducted to assess the effects of long-term exposure to DDT. Twenty subjects from Lucknow, India engaged in spraying DDT for periods ranging from 1 to 32 yr were tested. Health-related questionnaires were completed by all subjects. Blood samples were collected and analyzed for DDT and its metabolites. Controls consisted of 15 workers not exposed to DDT. The levels of ΣDDT in serum of the exposed group ranged from 43 to 791 ppb. DDE ranged from 28 to 320 ppb. DDD (TDE) ranged from none detected to 99 ppb. *p,p'*-DDT ranged from 9 to 548 ppb. The daily intake level was about 10 mg/day, compared to the acceptable daily intake of 0.25 mg. No correlation was seen between time of exposure and DDT levels in the blood. Although none of the workers complained of any DDT-poisoning symptoms, several showed abnormal nerve conduction.

81-2822. Nehez, M.; Paldy, A.; Selypes, A.; Berencsi, G.; Czeizel, A.; Szentesi, I.; Csanko, J.; Levay, K.; Maurer, J.; Nagy, E. (Inst. Hyg. & Epidemiol., Univ. Med., Szeged, Hungary) **Epidemiological data of agrochemical workers with special regard to cytogenetics.** *Mutat. Res.* 85(4): 255-256; 1981.

This work presents epidemiological and cytogenetical data on workers exposed to pesticides. The authors wanted to register some pathognomic phenomena that might be the result of long-term effects of pesticides. The epidemiological survey was carried out by personal interview, based on a systematic questionnaire, with 1600 workers exposed to pesticides and 800 control persons. Lethal and visible manifestations of gametic mutations were investigated: the number of all pregnancies, live births, stillbirths, miscarriages, birth wt of newborns, inborn errors, rate of infant death and late death. Lymphocytic chromosomes of some of the workers were examined to show somatic mutations. Cholinesterase activity was also measured. The results show that more pregnancies occurred in families not being exposed to pesticides. Some data of the study do not exclude the possibility of mutagenic effect. (Author abstract by permission, modified)

81-2823. Smith, A. H.; Matheson, D. P.; Fisher, D. O.; Chapman, C. J. (Dep. Epidemiol., Wellington Clin. Sch. Med., Wellington, NZ) **Preliminary report of reproductive outcomes among pesticide applicators using 2,4,5-T.** *N. Z. Med. J.* 93(680): 177-179; 1981 (15 references).

Results of a questionnaire survey of 459 New Zealand workers employed as pesticide applicators are reported. All participants in the study were married. The survey included questions regarding extent of the worker's exposure to agricultural chemicals and reproductive history (the worker's or spouse's number of pregnancies, stillbirths, or miscarriages, and the number of offspring with congenital defects). Comparison was made with a group of 422 married agricultural contractors, who were judged to have similar lifestyles and incomes. A total of 1172 births in families of chemical applicators and 1122 births in families of agricultural contractors were compared. No significant differences were found in the rates of stillbirths or miscarriages, and no significant differences were found in the rates of congenital defects (20/1000 births for pesticide applicators and 16/1000 for agricultural contractors). It is reported that 2,4,5-T is the main chemical sprayed in New Zealand; MCPA, MCPB, 2,4-D, paraquat, organophosphate insecticides, and other pesticides are also used. The principal application methods are backpack and boom spraying.

81-2824. Areekul, S.; Srichairat, S.; Kirdudom, P. (Dep. Radioisot., Fac. Trop. Med., Mahidol Univ., Bangkok, Thailand) **Serum and red cell cholinesterase activity in people exposed to organophosphate insecticides.** *Southeast Asian J. Trop. Med. & Public Health* 12(1): 94-98; 1981 (5 references).

Blood samples from patients admitted to the hospital for treatment of organophosphate insecticide poisoning and from workers at an organophosphorus insecticide manufacturing plant were analyzed for serum and red cell cholinesterase activities; values were compared to values from a control group. Serum cholinesterase levels in both groups were significantly lower than that of the control subjects. The poisoning victims also had lower serum cholinesterase activity than that of the workers. No significant differences were found in the red cell cholinesterase levels of the 3 groups. No relationships between serum or red cell cholinesterase activities and the duration of insecticide exposure were found. The hospitalized group had been poisoned by such compounds as malathion, parathion, dimethoate, Shelltox, and carbamates; some of their case studies and symptoms are discussed.

81-2825. Johnson, J. C.; Sanning, D. E. (JBF Sci. Corp., Wilmington, MA) **Stabilization, testing and disposal of arsenic-containing wastes.** In: *Toxic and Hazardous Waste Disposal, Options for Stabilization/Solidification.* Pojasek, R. B., ed. (Ann Arbor Sci. Publ. Inc.:

Ann Arbor): 2(CH11): 201-215; 1979 (6 references).

Methods were researched to make arsenic-laden residues safe for disposal at sites less restricted than the present requirements. The 3 forms of arsenic-bearing wastes of concern were termed waste 1 (residues from the manufacture of organic arsenical herbicides), waste 2 (filter cake from the production of food-grade phosphoric acid), and waste 3 (flue dusts from nonferrous smelting operations). Commercially available techniques varied greatly in their success in retarding arsenic leaching from the 3 wastes. All processes seemed to produce diffusion-limited leaching behavior for wastes 2 and 3. For all 3 wastes, the elutriate test on crushed samples gave useful data on the separate question of leaching behavior in the event that the monolithic structure should break down. The 3 wastes studied were very different in their response to fixation trials, as determined by leaching behavior. The least success with all the processes tried occurred with waste 1.

81-2826. McNeese, J. A.; Dawson, G. W.; Christensen, D. C. (Battelle Pac. Northwest Lab., Richland, WA) **Laboratory studies on fixation of Kepone-contaminated sediments.** In: *Toxic and Hazardous Waste Disposal. Options for Stabilization/Solidification.* Pojasek, R. B., ed. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): 2(CH12): 217-228; 1979 (10 references).

Products for the stabilization of Kepone (chlordecone)-contaminated sediments were examined. Epoxy grout and molten sulfur mixture were the only 2 agents tested that satisfactorily reduced the availability of Kepone to leachate. With both of these substances, no change in pH to strongly alkaline conditions occurred, but with cementaceous-type fixatives, great increases in pH were necessary for proper fixation agent curing. Some additives used with cementaceous agents reduced the leach rate of Kepone, but the net effect was insignificant. It was recommended that for evaluating stabilization products elevated pH values should be used when examining leach rates from unfixed sediments containing Kepone.

81-2827. Wells, R. D. (Army Environ. Hyg. Agency, Aberdeen Proving Ground, MD) **Guide for the prevention, control, and cleanup of pesticide fires.** *US NTIS AD Rep.* AD-A087,605/2: 14 pp.; 1980 (3 references).

Guidance is provided for preplanning, fighting, and cleaning up of pesticide fires to aid in the reduction or prevention of personal harm or environmental damage caused by a pesticide fire emergency. Also included are burning characteristics of pesticides and first-aid procedures in the event of exposure to pesticides. (Author abstract by permission)

81-2828. Kirkham, W. R. (Off. Aviat. Med., Fed. Aviat. Admin., Washington, DC) **Medical and toxicological factors in aircraft accidents.** *US NTIS AD Rep.* AD-A087,690/4: 12 pp.; 1980 (3 references).

A number of factors operating within pilots may impair their ability to operate aircraft in a safe manner, thus accounting for some of the 83-87% of pilot causes of general aviation accidents. Aircraft accident investigators should be attuned to characteristics of the accident, witness statements, and autopsy and laboratory findings that may suggest partial or complete incapacitation in the pilot. Incapacitation may be brought on by a medical condition which may be revealed at autopsy or be inferred only from medical history. Spatial disorientation is a subjective evaluation only and a form of incapacitation rated as the third most frequent cause of fatal general aviation accidents. Lack of oxygen (hypoxia) is a constant threat to incapacitate in aircraft operating at high altitudes. Toxicological factors such as alcohol, drugs, and gases (carbon monoxide) should always be sought in fatal aircraft accidents by obtaining blood, urine and other specimens for laboratory analyses. Aerial application pilots may be incapacitated by the poisonous materials they apply, especially the cholinesterase-inhibiting insecticides. The finding of therapeutic drugs in the blood or other specimens from accident victims, or of tablets, pills, etc., at the scene, may point to underlying medical conditions that may impair pilot performance. The author discusses these principles and illustrates them briefly with cases to make accident investigators and others aware of the importance of medical and toxicological factors in aircraft accidents. (Author abstract by permission)

81-2829. Lillie, J. H.; Hamilton, M. A.; Livingston, J. M.; Porter, K. (Occup. & Environ. Health Lab., US Air Force, Brooks AFB, TX) **The effects of water temperature on decontamination of pesticide applicator clothing.** *US NTIS AD Rep.* AD-A091,934/0: 11 pp.; 1980 (11 references).

The mean quantities of pesticide residue remaining in pesticide treated cloth samples were compared after washing in cold (30°C), warm (43°C), or hot (60°C) water. The pesticides malathion, bromacil, diazinon, chlordane, and propoxur were tested. A significant ($p = 0.01$) amount of pesticide residue was removed regardless of water temperature; however, there was a trend toward increased residue removal with increased temperature. It is recommended that the wash water temperature be $\geq$ 60°C to achieve maximum decontamination of pesticide applicator clothing. (Author abstract by permission)

81-2830. Off. Pestic. Programs, US EPA, Arlington, VA **Aspon: pesticide registration standards. O,O,O,O,-Tetrapropyl dithiopyrophospate.** *US NTIS PB Rep.* PB81-112,484: 146pp.; 1980(61 references).

The report contains a comprehensive statement of the Agency's regulatory position on all pesticide products containing the active ingredient O,O,O,O-tetrapropyl di-

thiopyrophosphate (Aspon, ENT 16 894). It describes the data upon which the regulatory position is based, provides the rationale for the position and states the conditions which must be met to register a product under a standard. (Author abstract by permission)

81-2831. Off. Pestic. Programs, US EPA, Arlington, VA **Chloroneb: pesticide registration standards.** *US NTIS PB REP.* PB81-123,804: 181 pp.; 1980(464 references).

This report contains a comprehensive statement of the Agency's regulatory position on all pesticide products containing the same active ingredient. The document, which discusses chloroneb, describes the data upon which the regulatory position is based, provides the rationale for the position and states the conditions which must be met to register a product under a standard. (Author abstract by permission)

81-2832. Off. Pestic. Programs, US EPA, Arlington, VA **Fumarin: pesticide registration standard.** *US NTIS PB Rep.* PB81-123,812: 58 pp.; 1980(23 references).

The report includes a comprehensive statement of the Agency's regulatory position on all pesticide products containing the active ingredient fumarin (coumafuryl). The document describes the data upon which the regulatory position is based, provides the rationale for the position and states the conditions which must be met to register a product under a standard. (Author abstract by permission)

81-2833. Off. Pestic. Programs, US EPA, Arlington, VA **Metolachlor: pesticide registration standards.** *US NTIS PB REP.* PB81-123,820: 173pp.; 1980(343 references).

This report includes a comprehensive statement of the Agency's regulatory position on all pesticide products containing the same active ingredient. The document, which discusses metolachlor, describes the data upon which the regulatory position is based, provides the rationale for the position and states the conditions which must be met to register a product under a standard. (Author abstract by permission)

81-2834. Off. Pestic. Programs, US EPA, Arlington, VA **Terrazole: pesticide registration standard 5-ethoxy-3-trichloromethyl- 1,2,4-thiadiazole.** *US NTIS PB Rep.* PB81-126,716: 125pp.; 1980(156 references).

This report includes a comprehensive statement of the Agency's regulatory position on all pesticide products containing the active ingredient Terrazole (etridazole). The document describes the data upon which the regulatory position is based, provides the rationale for the position and states the conditions which must be met to register a product under a standard. (Author abstract by permission)

See also 81-2705, 81-2706, 81-2707, 81-2710, 81-2714, 81-2719, 81-2735, 81-2740, 81-2741, 81-2743, 81-2757, 81-2758, 81-2759, 81-2780, 81-2782, 81-2790, 81-2794, 81-2796, 81-2803, 81-2805 *and* 81-2916.

81-2835. Neal, R. A. (Cent. Toxicol., Dep. Biochem., Sch. Med., Vanderbilt Univ., Nashville, TN 37232) **Chemical mechanisms of the cytochrome P-450 monooxygenase-catalyzed metabolism of phosphorothionate triesters.** *ACS Symp. Ser.* 158(CH02): 19-34; 1981 (29 references).

Results of studies on the mammalian microsomal metabolism of the phosphorothionate triester parathion are presented. The toxic effects of parathion are due to its conversion by the cytochrome P-450-containing monooxygenase enzyme systems in insects and mammals to the corresponding phosphate triester (paraoxon), which is a potent inhibitor of acetylcholinesterase. A scheme for the metabolism of parathion by mammalian microsomes is presented, along with a chemical mechanism for the metabolism of parathion to paraoxon. It has been shown experimentally that the sulfur atom is the site of the initial attack of the cytochrome P-450-generated oxygen atom, and that the attacking oxygen atom is retained by paraoxon. Other products of parathion metabolism are diethyl phosphorothionate and diethyl phosphate plus *p*-nitrophenol. The proposed mechanisms for their production are discussed. Further *in vitro* studies using rat liver microsomes have been carried out to determine the factors controlling the rate of breakdown of the proposed intermediate S-oxide of parathion to the various products.

81-2836. Fukuto, T. R.; Fahmy, M. A. H. (Div. Toxicol. & Physiol., Dep. Entomol., Univ. Calif., Riverside, CA 92521) **Sulfur in propesticide action.** *ACS Symp. Ser.* 158(CH03): 35-49; 1981 (37 references).

Examples are presented of the derivatization of methylcarbamate and phosphoramidothioate insecticides with different functional groups to give a variety of sulfur propesticides. An important advantage of the introduction of a thiono sulfur in an organophosphorus insecticide is the delay factor, provided by the P=S to P=O activation. This allows mammals to detoxify the toxicant. It is shown that mammalian toxicity may be decreased, along with retention of insecticidal activity. An example is malathion, whose slow *in vivo* oxidation to the anticholinesterase malaoxon produces a low mammalian toxicity. Several other examples are given; toxicological properties of derivatives are included. It is noted that this approach can also be applied to herbicides and fungicides which contain the appropriate groups for derivatization.

81-2837. Hutson, D. H. (Shell Res. Ltd., Shell Toxicol. Lab., Sittingbourne Res. Cent., Sittingbourne, Kent ME9 8AG, England) ***S*-Oxygenation in herbicide metabolism in mammals.** *ACS Symp. Ser.* 158(CH04): 53-64; 1981 (14 references).

Studies on sulfur-oxygenation in 2 classes of sulfur-containing herbicides (the alkylthio-s-triazines and the thiocarbamates) are reported. Both of these classes of herbicides have been shown to have similar modes of biotransformation, involving *S*-oxygenation. In studies on the metabolic fate of the alkylthiotriazine cyanatryn, it was seen that 2 of the major metabolites were mercapturic acids. In studies in which cyanatryn was incubated with rat liver microsomes, the reactivity of the metabolite cyanatryn *S*-oxide with sulfur nucleophiles was demonstrated. An analogous situation was found when thiocarbamate herbicides were incubated with liver microsomes, resulting in the formation of thiocarbamate sulfoxides. These reactions indicate microsomally-mediated bioactivation reactions, which are important in detoxification in mammals, and may also be important in selective toxicity in plants. *In vitro* studies using rat liver microsomes and rat blood which further elucidated these reactions are described.

81-2838. Schuphan, I.; Segall, Y.; Rosen, J. D.; Casida, J. E. (Pestic. Chem. Toxicol. Lab., Dep. Entomol. Sci., Univ. California, Berkeley, CA 94720) **Toxicological significance of oxidation and rearrangement reactions of *S*-chloroallyl thio- and dithiocarbamate herbicides.** *ACS Symp. Ser.* 158(CH05): 65-82; 1981 (31 references).

A review is presented of the *S*-chloroallyl thio- and dithiocarbamate herbicides, emphasizing the toxicological significance of their oxidation and rearrangement reactions. The synthesis and spectral features of the thiocarbamate sulfoxides and the dithiocarbamate sulfines are described, and the rearrangements and oxidations are discussed in detail. Thio- and dithiocarbamates probably require metabolic activation prior to exerting their herbicidal effects. The *Salmonella typhimurium* Ames assay indicates that *S*-(2-chloroallyl) thio- and dithiocarbamate herbicides show mutagenic activity, while the *S*-alkyl thiocarbamates do not. It is suggested that the herbicidal and mutagenic activities of the *S*-chloroallyl thio- and dithiocarbamates may be due to the generation of potent chloroacrolein mutagens and herbicides via sulfoxide or 002S-hydroxymethylene intermediates.

81-2839. Schuphan, I.; Westphal, D.; Haque, A.; Ebing, W. (Inst. Pflanzenschutzmittelforsch., Biol. Bundesanst., D-1000 Berlin 33, BRD) **Biological and chemical behavior of perhalogenmethylmercapto fungicides: metabolism and *in vitro* reactions of dichlofluanid in comparison with captan.** *ACS Symp. Ser.* 158(CH06): 85-96; 1981 (20 references).

Comparisons are made between the chemically related fungicides captan and dichlofluanid. In particular, studies on the metabolic fate of dichlofluanid in strawberries, captan in spinach and soil, and the *in vitro* reactions of dichlofluanid with cell thiols are described. The behavior of metabolites in the Ames assay is also discussed. When strawberry plants were treated with [^{14}C]dichlofluanid, no parent compound was detected in the strawberry fruits, and 83% of the radioactive material

was unidentified, very polar metabolites. Three percent was identified as thiazolidine-2-thione-4-carboxylic acid. A proposed mechanism for the metabolism of [^{14}C]dichlofluanid in strawberries is presented. Studies on metabolism of captan in spinach indicate similarities with dichlofluanid metabolism in strawberries. With regard to Ames mutagenicity testing, captan is a strong mutagen, while dichlofluanid and 2 of its metabolites are not mutagenic to *Salmonella typhimurium* TA 100. It is inferred that the fluorine atom has a fundamental influence on mutagenicity, since the fluoride analogues are generally not mutagenic, in contrast to the chlorine compounds.

81-2840. Ku, C. C.; Kapoor, I. P. (American Cyanamid Co., Agric. Res. Div., Princeton, NJ 08540) **Comparative metabolism of dithiolane insecticides in plants, animals, and the environment.** *ACS Symp. Ser.* 158(CH07): 97-109; 1981 (6 references).

Results are presented of studies on the metabolism of 2 ^{14}C-dithiolane insecticides (phosfolan and mephosfolan) labeled in the imido carbon position. Rats, cotton plants, and a simulated rice paddy environment were used in the studies. In rats, both insecticides showed their major degradation route to be hydrolysis to iminodithiolane, then to thiocyanate, then CO_2. In cotton plants treated with mephosfolan, hydroxylation of the methyl moiety of the iminodithiolane ring and conjugation as glucoside was a significant pathway. When a rice paddy environment was treated with mephosfolan, mephosfolan was found in the rice plants, but did not accumulate in the rice grain. The rice plants assimilated mephosfolan rapidly, degraded it, and incorporated the ^{14}C-carbon into the natural plant products. Mephosfolan was readily metabolized by fish in the paddy environment into thiocyanate and many polar metabolites.

81-2841. Matsumura, F.; Yoneyama, K.; Clark, J. M. (Pestic. Res. Cent., Michigan State Univ., East Lansing, MI 48824) **Roles of iron-sulfur proteins in degradation of pesticidal chemicals by microoorganisms.** *ACS Symp. Ser.* 158(CH08): 111-129; 1981 (56 references).

The properties of some iron-sulfur proteins are described and related to their possible role in pesticide degradation reactions by microorganisms. Several forms of iron-sulfur proteins are discussed, and their sources given. These proteins are good mediators of electron transfer, and thus can play a role in the degradation of organic pollutants where oxidative or reductive reactions are involved. Experimental evidence for this is given, including the degradation of mexacarbate by ferredoxin and the metabolic degradation of toxaphene by *Pseudomonas putida.* The degradation of mexacarbate in cell-free extracts of *Bacillus megaterium* is also described.

81-2842. Bakke, J. E.; Larsen, G. L.; Aschbacher, P. W.; Rafter, J. J.; Gustafsson, J. A.; Gustafsson, B. E. (Metab. & Radiat. Res. Lab., Agric. Res., SEA, USDA, Fargo, ND 58105) **Role of gut microflora in metabolism of glutathione conjugates of xenobiotics.** *ACS Symp. Ser.* 158(CH10): 165-178; 1981 (42 references).

Current research on the metabolic fate of the xenobiotic moieties of mercapturic acid pathway (MAP) metabolites that are excreted from liver and bile is described. It is known that the products of MAP undergo an enterohepatic circulation that is mediated by intestinal enzymes and/or intestinal microflora. The metabolism of propachlor, as studied in rats and other mammals, is discussed in detail, and is shown to utilize microfloral C-S lyases. Species differences in the metabolism of propachlor are summarized. All species studied metabolized propachlor in the MAP; differences included no excretion of cysteine conjugate in the rats, and no methylsulfonyl formation by chickens. Studies on 2 acetoamido-4-chloromethylthiazole are reported; metabolism utilizing tissue C-S lyases and microfloral S-glucuronidases is indicated, in addition to the microfloral C-S lyase.

81-2843. Stankiewicz, M. (Agric. Univ., Inst. Agric. Chem., Soil Sci. & Microbiol, Wroclaw Poland) **Interactions of *Mycelia sterilia* G-1 with Venzar and Pyramin.** *Acta Microbiol. Pol.* 30(1): 33-39; 1981 (17 references).

The effects of the herbicide Venzar (lenacil) alone and in combination with Pyramin (chloridazon) on metabolic pathways of the microorganism *Mycelia sterilia* were studied. *M. sterilia* cultures were incubated for 44 to 195 days with single or mixed herbicides (100 ppm each); the effects of the herbicides on cell metabolism were examined by fractionation of the culture supernatant. Amino acids, proline, sugars, and organic acids were determined. Lenacil stimulated the growth of *M. sterilia* (from 68.3 to 136.0 mg dry wt of mycelium after 186 days of incubation). Chloridazon had no effect on fungal growth and decreased the lenacil effect. Lenacil stimulated the release of free amino acids (notably proline), while chloridazon had no effect. Lenacil was degraded by the fungus by means of inductive enzymes, resulting in a decrease in the phytotoxicity of lenacil. Chloridazon inhibited the production of these enzymes; thus, the phytotoxicity of lenacil in the presence of chloridazon was not decreased.

81-2844. Holme, J. A.; Dybing, E. (Dep. Toxicol., Natl. Inst. Public Health, Oslo 1, Norway) **Induction of liver microsomal cytochrome P-450 and associated monooxygenases by octachlorostyrene in the rat.** *Acta Pharmacol. Toxicol. Suppl.* 49(1): 47; 1981.

Rats were used in studies to determine the effects of single ip doses of octachlorostyrene (OCS) and hexachlorobenzene (HCB) on liver microsome parameters.

Results are compared with those from the model inducers phenobarbitol and 3-methylcholanthrene. Both OCS and HCB increased microsomal protein and cytochrome P-450 contents, and activities of cytochrome P-450 reductase, ethylmorphine *N*-demethylase, paranitroanisole *O*-demethylase and acetanilide 4-hydroxylase. Cytochrome b_5 and arylhydrocarbon [benzo(a)pyrene] hydroxylase were not affected. It is concluded that under these experimental conditions, OCS and HCB are primarily inducers of the phenobarbitol class. [Presented at the 23rd Scandinavian Pharmacol. Soc. meet.]

81-2845. Sterri, S. H.; Fonnum, F. (Norwegian Def. Res. Establ., Div. Toxicol., Kjeller, Norway) **Detoxification of organophosphorus compounds.** *Acta Pharmacol. Toxicol. Suppl.* 49(1): 89; 1981.

Guinea pigs and rats injected every 24 hr with sublethal doses of soman and sarin were studied to determine factors responsible for the detoxification of these compounds. Less detoxification was observed in animals injected with tri-ortho-cresyl- phosphate, an inhibitor of aliesterase, indicating the importance of aliesterase in this process. The enzyme somanase is also thought to be involved, based on data obtained after perfusion of liver with soman. [Presented at the 23rd Scandinavian Pharmacol. Soc. meet.]

81-2846. Walseth, F.; Nilsen, O. G. (Dep. Pharmacol. & Toxicol., Univ. Trondheim, Trondheim, Norway) **Reversibility of the effects of dibutylphthalate (DBP) on rat liver and lung microsomal enzyme activities and serum protein levels.** *Acta Pharmacol. Toxicol. Suppl.* 49(1): 90; 1981.

Male Sprague-Dawley rats were used in studies to determine the effects of dibutylphthalate (DBP) on liver and lung microsomal enzyme activities and serum protein levels. Rats were given low ig doses of DBP (0.01, 0.1 and 1.0 m*M*/kg body wt) for 5 days. Half the animals were sacrificed on day 6, and the remainder were allowed to recover for 4 wk. Another group was given an ip dose of 3.8 m*M*/kg body wt for 5 days without a recovery period. The hepatic concentration of cytochrome P-450 increased in the 0.01 m*M* group, and liver cytochrome-c-reductase increased in all groups; this effect was persistent for 4 wk. The *in vitro* liver metabolism of n-hexane increased, but had returned to normal within 4 wk. Serum albumin concentration decreased, but had normalized within 4 wk. In the lung, enzyme activities were not affected by ig treatment, but ip administration resulted in a decrease in cytochrome P-450 and cytochrome b_5. [Presented at the 23rd Scandinavian Pharmacol. Soc. meet.]

81-2847. Sastry, K. V.; Sharma, K. (Sch. Environ. Contam. & Toxicol., Dep. Zool. D.A.V. Coll., Muzaffarnagar 251001, India) **Effects of mercuric chloride on the activities of brain enzymes in a fresh water teleost, *Ophiocephalus (Channa) punctatus*.** *Arch. Environ. Contam. Toxicol.* 9(4): 425-431; 1980 (24 references).

The effects of an acute lethal (1.8 mg/l) and a sublethal concentration (0.3 mg/l) of mercuric chloride on the activities of alkaline phosphatase, acid phosphatase, glucose-6-phosphatase, Na^+,K^+ adenosine triphosphatase, succinic dehydrogenase, lactic dehydrogenase, pyruvic dehydrogenase and cholinesterase in the brain of a fresh water fish, *Ophiocephalus (Channa) punctatus*, were determined. Exposures were for 4, 15 or 30 days. Acute exposure to mercuric chloride inhibited alkaline phosphatase activity while chronic treatment increased the activity. Acid phosphatase and Na^+,K^+ adenosine triphosphatase activities were elevated after 4 days, but chronic exposure inhibited their activities. The activities of glucose-6-phosphatase, succinic dehydrogenase, lactic dehydrogenase, pyruvic dehydrogenase, and cholinesterase were inhibited by both acute and chronic treatments. Maximum inhibitions occurred after 4 days with alkaline phosphatase and cholinesterase, 15 days with acid phosphatase and 30 days with glucose-6-phosphatase, Na^+,K^+ adenosine triphosphatase, and the 3 dehydrogenases. (Author abstract by permission)

81-2848. Kenney, R. M.; Michaels, I. A. L.; Flomenbau, N. E.*; Yu, G. S. M. (Bronx Munic. Hosp. Cent., Bronx, NY 10461) **Poisoning with N-3-pyridylmethyl-*N'*-*p*-nitrophenulurea (Vacor). Immunoperoxidase demonstration of β-cell destruction.** *Arch. Pathol. Lab. Med.* 105(7): 367-370; 1981 (32 references).

The case of a woman who ingested 2 packets of the rodenticide *N*-3-pyridylmethyl- *N'*-*p*-nitrophenylurea (pyriminil) is reported. The patient developed diabetes and anion-gap metabolic acidosis. The diabetes was treated successfully, but cecal perforation developed, and the patient died 6 days after the original ingestion. Upon autopsy, histological examination of various tissues showed pancreatic β-cell destruction and suggested a decrease in the number of α cells present. Peripheral nerve degeneration was also seen.

81-2849. Zbinden, G.; Flury-Roversi, M. (Inst. Toxicol., Swiss Fed. Inst. Technol., CH-8603 Schwerzenbach, Switzerland) **Significance of the LD50-test for the toxicological evaluation of chemical substances.** *Arch. Toxicol.* 47(2): 77-99; 1981 (52 references).

This review of the LD50-test shows that the precision of the procedure is dependent on the number of animals used. But even with large numbers of animals there are considerable variations of the test results, because the numerical value of the LD50 is influenced by many factors, such as animal species and strain, age and sex, diet, food deprivation prior to dosing, temperature, caging, season,

experimental procedures, etc. Thus, the LD50 value cannot be regarded as a biological constant. The influence of food deprivation on the toxicity of the pesticide Mesurol (methiocarb) is presented as an example; starved rats showed higher toxicity than rats fed *ad libitum*. Through standardization of the test animals and the experimental conditions the variability of the LD50 determinations can be reduced but never fully eliminated. There are several tests with which an approximate LD50 can be determined. These methods use fewer animals than the classical LD50-test, but their precision and reproducibility are sufficient for most purposes of acute toxicity testing. Differences in LD50s reported by various laboratories are presented in tabular form; data for the pesticide PCP are is included. In all cases where the acute toxicity test is mainly concerned with the evaluation of toxicological potential of the test substances, the symptomatology following acute overdosing, and the knowledge of target organs of toxicity, the classical LD50-test should be replaced by a more comprehensive short term test that can be done with small numbers of animals. The classical LD50-test should only be permitted in those rare instances where a high precision of the LD50 determination is indispensable. (Author abstract by permission, modified)

81-2850. Richter, E.; Schaefer, S. G. (Inst. Pharmakol. & Toxicol., Med. Fak. Ludwig-Maximilians-Univ. Muenchen, D-8000 Munich, BRD) **Intestinal excretion of hexachlorobenzene.** *Arch. Toxicol.* 47(3): 233-239; 1981 (16 references).

The intestinal excretion of hexachlorobenzene (HCB) was studied in rats using the method of pendular perfusion. One and 4 wk after ip application of 100 mg HCB/kg body wt segments of jejunum, ileum and colon were perfused with light liquid paraffin or squalane for 5 hr. The highest amount of HCB was excreted into jejunum, followed by ileum and colon. After 5 hr HCB concentration in jejunal perfusion medium equals that in plasma. Serosal tissue of intestinal segments contained higher HCB concentrations as compared to mucosa. Paraffin treatment decreased the HCB content in both serosal and mucosal tissue of jejunum and ileum but not of colon. (Author abstract by permission)

81-2851. Anonymous **What are the toxic effects of the insecticide gamma-BHC? Could overexposure cause abnormal hair growth or loss of hair in girls?** *Br. Med. J.* 282(6283): 52; 1981 (3 references).

Information is presented on the toxic effects of the insecticide γ-BHC (lindane). The single oral LD50 dose for rats is 90 mg lindane/kg. The signs of poisoning are neurological (tremor, ataxia, convulsions, prostration), with aplastic anemia occasionally reported. Hepatotoxic reactions occur only at high doses. Lindane (1%) is used as an ectoparasiticide. A reported association between lindane poisoning and alopecia is disputed; alopecia or abnormal hair growth were never before reported as an adverse effect of lindane. It is suggested that lindane has a good environmental record; justified cases of intoxication are rare, while use is widespread.

81-2852. Stratton, G. W.; Corke, C. T. (Dep. Biol., Nova Scotia Agric. Coll., Truro, Nova Scotia B2N 5E3, Canada) **Interaction between acetone and two pesticides towards several unicellular green algae.** *Bull. Environ. Contam. Toxicol.* 27(1): 13-16; 1981 (12 references).

Data are presented which indicate that acetone can interact with pesticides additively, synergistically, and antagonistically, when tested for the effect on photosynthesis in green algae. Test organisms used were the green algae *Chlorella pyrenoidosa* and *Scenedesmus quadricauda*. Pesticide concentrations were 100 mg/l permethrin for both algae, 0.3 mg/l atrazine for *S. quadricauda*, and 0.5 mg/l atrazine for *C. pyrenoidosa*. Each concentration of pesticide was combined with acetone concentrations of 0.1, 0.2, 0.4, 0.6, 0.8, and 1.0% (v/v). Acetone alone was not inhibitory to either algae. Photosynthetic activity was stimulated above 0.2% acetone. A stimulation of 30-40% was reached at 1.0% acetone. Acetone and permethrin interacted in an additive manner in both algae at all levels of solvent assays. Acetone and atrazine combined to produce a more complex series of responses. It is suggested that acetone may alter membrane structure and permeability.

81-2853. Nichol, A. W.; Elsbury, S.; Rousseaux, C. G. (Sch. Appl. Sci., Riverina Coll. Adv. Educ., Wagga Wagga 2650, Australia) **Porphyrin accumulation in sheep bones associated with 1,2,4-trichlorobenzene.** *Bull. Environ. Contam. Toxicol.* 27(1): 72-78; 1981 (13 references).

Bones were obtained from sheep carcasses after it was noted that they fluoresced pink under UV light. Extraction of the pigment from the bone was achieved by milling roughly broken sections of humerus and scapula in a Spex freezer mill under liquid nitrogen. The finely milled bone was suspended in dry methanol and saturated with dry hydrogen chloride. Examination under long wavelength UV light indicated that the pink fluorescent substance was dissolved in the methanol. Quantitative analysis of porphyrins in the methanol extract was carried out by scanning the spectrum of the extract from 390 nm to 425 nm. Extraction was also carried out on sheep fat. The excitation and emission maxima of the bone suspension were compared with those of protoporphyrin and coproporphyrin, and showed maxima intermediate between these 2 compounds. Thin-layer chromatography identified protoporphyrin dimethyl ester, 2,4-di(l′-methoxyethyl) deuteroporphyrin dimethyl ester and coproporphyrin tetramethyl ester. Gas chromatographic analysis of sheep bone fat identified trace amounts of 1,2,3-trichlorobenzene and 1,3,5-trichlorobenzene. Trichloro-

benzene has been shown to be a major metabolite of lindane, and is also weakly porphyrogenic in rats. Lindane has been shown to cause elevation of porphyrin levels in tissue culture systems. Lindane is widely used in the area where the sheep were raised. It is concluded that both the porphyrin and trichlorobenzene accumulation were results of lindane exposure.

81-2854. Skea, J. C.; Simonin, H. J.; Jackling, S.; Symula, J. (Field Toxicant Res. Unit., Dep. Environ. Conserv., Bur. Environ. Conserv., Rome, NY 13440) **Accumulation and retention of mirex by brook trout fed a contaminated diet.** *Bull. Environ. Contam. Toxicol.* 27(1): 79-83; 1981 (2 references).

Brook trout (200) were fed a mirex-contaminated diet for 104 days. Fish were fed 0.7 mg mirex/kg body wt 3 times/wk. After 17, 32, 56, 86, and 104 days, 10 fish were selected at random for analysis. After 104 days, fish were placed on a mirex-free diet. Examinations were made of 10 fish at 16, 32, 56, 86, 150, and 385 day intervals after removal from the contaminated feed. After 104 days of feeding, the average concentration in the fish was 6.3 μg/g. Accumulation was rapid and never reached a plateau level. After 385 days of mirex-free feed, the concentration had dropped to an average of 2.1 μg/g. Brook trout increased in wt during this elimination phase, from an average of 175 g to 571 g. It is concluded that the decline in mirex concentration was due to growth dilution.

81-2855. Kobayashi, K.; Kishino, T. (Lab. Fish. Environ. Sci., Fac. Agr., Kyushu Univ., Fukuoka 812, Japan) **Effect of pH on the toxicity and accumulation of pentachlorophenol in goldfish.** *Bull. Jpn. Soc. Sci. Fish.* 46(2): 167-170; 1980 (8 references).

Studies were conducted to determine the effects of pH on the toxicity and accumulation of PCP in *Carassius auratus*. For the toxicity tests, 24 hr LC50 values were determined at various pH levels. The results indicate that decreases in the pH resulted in increased toxicity. The 24-hr LC50 at pH 10 was 16 ppm; pH 9 increased the toxicity almost 5 fold (24 hr LC50 = 2.2 ppm); pH 7 resulted in an LC50 of 0.082 and a pH of 5 resulted in an LC50 of 0.052. The amounts of PCP accumulated by the fish increased almost linearly as exposure time and PCP concentration at each pH increased. However, accumulation decreased with increased pH. The bioconcentration ratios of PCP by the fish decreased with the increase of pH. At 1 hr exposure to 0.1 ppm PCP at pH 5.5, the bioconcentration ratio was 131. At pH 10, however, the bioconcentration ratio was 2. It appears that the reduced toxicity of PCP at higher pH levels is a result of decreased accumulation; PCP does not reach toxic levels in the tissues at high pH values.

81-2856. Daniels, R. E.; Allan, J. D. (Dep. Zool., Univ. Maryland, College Park, MD 20742) **Life table evaluation of chronic exposure to a pesticide.** *Can J. Fish. Aquat. Sci.* 38(5): 485-494; 1981 (27 references).

The copepod *Eurytemora affinis* and the cladoceran *Daphnia pulex* were cultured at sublethal concentrations of dieldrin to test the usefulness of the intrinsic rate of population increase, *r*, as a bioassay statistic. The 48-hr LC50 for *E. affinis* was 23 μg/l, but population growth rate measured by the life table method was only 12% of its control value at 5 μg/l and was zero at 10 μg/l, indicating a substantial sublethal effect. In contrast, *D. pulex* had a higher EC50 (251 μg/l) and showed little impairment of population growth potential below 220 μg/l. We suggest that the cladoceran was less sensitive than the copepod in both short- and long-term tests because of its simpler life cycle and larger size at hatching. The life table estimate of *r* appears to be an ecologically realistic measure of sublethal stress and requires an equivalent or shorter time to conduct than conventional long-term tests. (Author abstract by permission)

81-2857. Koprda, V.; Trnovec, T.; Gajdosikova, A.; Gajdosik, A.; Greguskova, M.; Vargova, M.; Scasnar, V. (Inst. Exp. Pharmacol., Slovak Acad. Sci., Bratislava, Czechoslovakia) **Distribucia ^{14}C-trimorfamidu u potkana. [Distribution of ^{14}C-trimorfamide in the rat.]** *Cesk. Hyg.* 26(4): 181-185; 1981 (9 references) (Czech).

The determination of the percentage of the administered ^{14}C-trimorfamide activity in rat organs in time intervals exceeding 12 hr exhibited a wide range of results due to the rapid elimination of the substance by the animals and low residual levels of the undecomposed substance in organ tissues. The velocity of trimorfamide elimination from rat organs exceeded the velocity of its hydrolytic decomposition. The elimination process probably includes the original trimorfamide, products of hydrolytic decomposition and of metabolic transformation. Initially the highest levels were found in the adrenal glands, while the lowest levels were observed in the brain and fatty tissues.

81-2858. Koprda, V.; Trnovec, T.; Gajdosik, A.; Gajdosikova, A.; Greguskova, M.; Vargova, M.; Scasnar, V. (Inst. Exp. Pharmacol., Slovak Acad. Sci., Bratislava, Czechoslovakia) **Eliminacia ^{14}C-trimorfamidu zorganizmu potkana a mysi. [Elimination of ^{14}C-trimorfamide from the organism of rats and mice.]** *Cesk. Hyg.* 26(4): 186-191; 1981 (10 references) (Czech).

The metabolism of ^{14}C-trimorfamide administered po was studied in rats. Only 40% of the initial amount of the substance was identified in liver and 80% in kidney 1 hr following administration. In urine the undecomposed compound decreased with time to 2-4% after 24 hr. Hydrolytic decomposition was accompanied by intensive metabolic processes. Several hours after intake urine contained up to 25 times the amount of metabolites compared with the undecomposed compound. The distribution of trimorfamide in whole body sections of mice was studied using

autoradiography. The autoradiograms of whole body slices 1, 3, and 6 hr after administration demonstrated the presence of high amounts of trimorfamide in the wall of the urinary bladder, large veins, gall bladder, and ductus choledochus. The high levels of the compound and its metabolites in the gall bladder indicate the importance of the enterohepatic mechanism in their excretion.

81-2859. Adema, D. M. M.; Vink, G. J. (Div. Technol. Soc., Delft, The Netherlands) **A comparative study of the toxicity of 1,1,2-trichloroethane, dieldrin, pentachlorophenol and 3,4-dichloroaniline for marine and fresh water organisms.** *Chemosphere* 10(6): 533-554; 1981 (17 references).

Aquatic toxicity of the organochlorine compounds, 1,1,2-trichloroethane, dieldrin, PCP, and 3,4-dichloroaniline, in 15 marine and freshwater animals and in unicellular algae is reported. Static, semi-static, and flow-through tests were used to determine acute, subchronic, and chronic toxicity and to determine effects on reproduction. For 1,1,2-trichloroethane, the LC50 values ranged from 30 to 70 mg/l; sublethal effects were seen at 3-30 mg/l. For dieldrin, LC50 values lay between 0.0018 and 0.01 mg/l for fish and macrocrustaceans; sublethal effects were seen at 0.001-0.1 mg/l. For PCP, LC50 values ranged from 1 to 10 mg/l, with sublethal effects seen at 0.01-6 mg/l. For 3,4-dichloroaniline, sublethal effects were seen in the range 0.01-1 mg/l. The relative sensitivity of various test organisms is discussed.

81-2860. Kroes, R. (Inst. CIVO-Toxicol. & Nutr. TNO, Zeist, The Netherlands) **The predictive value of short-term screening tests for carcinogenicity.** *Chemosphere* 10(6): 605-625; 1981 (31 references).

Short-term screening tests for carcinogenicity of chemicals are discussed. Carcinogens are classified as genotoxic or non-genotoxic. The enzyme-inducing agents, DDT, DDE, and Phenocarb, are given as examples of non-genotoxic carcinogens. These compounds do not induce DNA repair in the Williams DNA repair test. Most tests used today detect mutagenic action, DNA damage, or malignant transformations. Combinations of tests have been shown to increase sensitivity, but sometimes at the cost of decreased specificity and accuracy. However, for the detection of genotoxic compounds, which are suspected of posing much greater risks to man than non-genotoxic compounds, the use of a battery of tests seems appropriate, especially if a mutagenicity test, a DNA repair test, and a cell transformation test are included.

81-2861. Wells, W. D. E.; Wright, N. (Reg. Poisoning Treat. Cent., Dudley Rd. Hosp., Birmingham B18 7QH, England) **Clinical features and management of poisoning with 2,4-D and mecoprop.** *Clin. Toxicol.* 18(3): 273-276; 1981 (3 references).

Two cases of intentional ingestion of the auxin hormone herbicide, Verdone, are reported. Verdone contains 2,4-D and mecoprop. In each case the depression of level of consciousness was a major feature of the clinical findings. No evidence of muscle damage was noted. A minor degree of liver damage and renal dysfunction was observed in one case. One patient exhibited raised blood urea and creatinine concentrations. Minor hepatic damage was demonstrated in one patient by a mild degree of hypoxia and metabolic acidosis, a transient rise in white blood cell count, aspartate aminotransferase, and a prothrombin ratio maximum of 1.4:1. The creatinine phosphokinase remained normal.

81-2862. Hassan, R. M.; Pesce, A. J.; Sheng, P.; Hanenson, I. B. (Dep. Pathol. & Lab. Med., Med. Cent. Univ. Cincinnati, Cincinnati, OH 45267) **Correlation of serum pseudocholinesterase and clinical course in two patients poisoned with organophosphate insecticides.** *Clin. Toxicol.* 18(4): 401-406; 1981 (8 references).

Two patients who had ingested large amounts of insecticides containing the cholinesterase inhibitors malathion and diazinon were admitted to the Cincinnati General Hospital. Severe intoxication was documented by the clinical manifestations and the low serum pseudocholinesterase values. Life support required large doses of atropine. Very low levels of enzyme activity of ≈ 130-140 mIU/ml were found during the period of severe intoxication. When pseudocholinesterase activity increased, there was corresponding clinical improvement. Since the observed initial enzyme levels of ≈ 100 mIU/ml cannot be reduced by the addition of the excess organophosphate or by heating, these values reflect total inhibition of true pseudocholinesterase activity. Return of enzymatic activity was directly correlated with improvement in the patient's clinical condition. Thus the data indicate that a value of ≈ 100-140 mIU/ml is the minimum value of pseudocholinesterase activity in the severely organophosphate-poisoned patient, and that the increase in enzyme level parallels regeneration of the true cholinesterase enzyme and serves as an indicator of clinical improvement in the patient. (Author abstract by permission, modified)

81-2863. Gallanosa, A. G.; Spyker, D. A.; Curnow, R. T. (Dep. Intern. Med., Sch. Med., Univ. Virginia, Charlottesville, VA 22908) **Diabetes mellitus associated with autonomic and peripheral neuropathy after Vacor rodenticide poisoning: a review.** *Clin. Toxicol.* 18(4): 441-449; 1981 (20 references).

Following ingestion of Vacor (pyriminil) rodenticide, a 42-yr-old female developed diabetes mellitus, peripheral neuropathy, and autonomic dysfunction. The toxicological and clinical effects of Vacor poisoning were reviewed. (Author abstract by permission)

81-2864. Doherty, J. D.; Salem, N., Jr.; Lauter, C. J.; Trams, E. G. (Hazard Eval. Div. (TS-769), US EPA, Washington, DC 20460) **Mn^{2+} and Ca^{2+} ATPases in lobster axon plasma membranes and their inhibition by pesticides.** *Comp. Biochem. Physiol. C* 69(2): 185-190; 1980 (29 references).

Divalent cation ATPases were studied in axonic membrane preparations derived from the lobster *Homarus americanus*. Separate Mn^{2+} and Ca^{2+} stimulated ATPases were distinguished. Mn^{2+} ATPase was found to be most active at 20°C whereas Ca^{2+} ATPase was most active at 37°C. Divalent cation ATPases were inhibited by the neurotoxic pesticides DDT, Kepone (chlordecone), plictran (cyhexatin) and allethrin with IC50 values ranging from 10^{-6} to 10^{-4} *M*. Oligomycin (IC50 10^{-7} *M*) was found to be a potent inhibitor of axonic membrane ATPases. Inhibition of divalent cation ATPase including ecto-ATPases may be related to the neurotoxicity of pesticides. (Author abstract by permission)

81-2865. Kaila, K.; Saarikoski, J. (Dep. Zool., Div. Physiol., Univ. Helsinki, SF-00100 Helsinki 10, Finland) **Membrane-potential changes caused by 2,4-DNP and related phenols in resting crayfish axons are not due to uncoupling of mitochondria.** *Comp. Biochem. Physiol. C* 69(2): 235-242; 1980 (50 references).

The effects of 2,4-dinitrophenol (DNP) and 6 other phenols on the resting membrane potential and resistance of the crayfish medial giant axon were studied. DNP (5×10^{-5}-10^{-3} *M*) caused a concentration-dependent depolarization up to 6mV which at higher concentrations ($1\text{-}5 \times 10^{-2}$ *M*) turned into a weak hyperpolarization. Taking into account the changes in membrane potential, the depolarization occurred together with a marked decrease in resistance suggesting an increase in resting potassium permeability. Phenol and most of the other derivatives (4-Cl; penta-Cl and 4-Cl-3,5-di-CH_3) had qualitatively similar effects except for 2,4,6-trinitrophenol (TNP) which showed no depolarizing action. Neither of the membrane-potential effects is likely to be due to uncoupling of oxidative phosphorylation in mitochondria, since the depolarizing action of DNP had a similar latency (about 5 sec) to that brought about by increasing the extracellular potassium concentration; and TNP, which is known not to act as an uncoupler in intact mitochondria, produced a prompt increase in the potassium permeability at a concentration in agreement with the relation between the potency and the octanol-water partition coefficient of the derivatives tested. (Author abstract by permission)

81-2866. Leatherland, J. F. (Dep. Zool., Coll. Biol. Sci., Univ. Guelph, Guelph, Ontario, Canada) **Effect of dietary mirex and PCBs on calcium and magnesium metabolism in rainbow trout, *Salmo gairdneri* and coho salmon, *Oncorhynchus kisutch*; a comparison with Great Lakes coho salmon.** *Comp. Biochem. Physiol. C* 69(2): 345-351; 1980 (23 references).

Dietary mirex (50 mg/kg dry wt of feed) or PCBs (500 mg/kg dry wt of feed) significantly lowered serum Ca^{2+} concentrations in yearling coho salmon (*Oncorhychus kisutch*); lower organochlorine levels and a mixed diet of mirex and PCB were without effect. There were no significant changes in serum Mg^{2+} concentrations. There were no significant changes in muscle or skeleton Ca^{2+} content in salmon, although fish fed mirex- or PCB-contaminated diets for 10 wk had elevated skeletal Mg^{2+} concentrations. Spawning female Lake Erie coho salmon had significantly lower serum Ca^{2+} levels than comparable fish from Lakes Ontario and Michigan, and serum Mg^{2+} levels in spawning Lake Erie fish of both sexes were significantly lower than in comparable fish from Lake Michigan. Significantly higher serum Ca^{2+} levels were found in the females in spawning coho salmon in Lakes Ontario and Michigan but not in fish from Lake Erie. The hypocalcemia evident in feral coho salmon from Lake Erie cannot be related to organochlorine content but may be a factor in the poor growth of coho salmon in Lake Erie compared with those in Lakes Ontario and Michigan. None of the contaminated diets had significant effects on the Ca^{2+} or Mg^{2+} levels in serum, muscle or skeleton of rainbow trout (*Salmo gairdneri*). Dietary mirex (50 mg/kg dry wt of feed) or PCBs (500 mg/kg dry wt of feed) significantly elevated muscle water content in trout but not in salmon and significantly lowered muscle lipid content. Hepatosomatic index values were significantly elevated in PCB-fed salmon and trout and wt gain was significantly lower in trout fed the high mirex or PCB diets. (Author abstract by permission)

81-2867. Hollingshaus, J. G. (Univ. California, Riverside, CA) **Delayed neurotoxicity of structural analogs and the chiral enantiomers of *O*-(4-bromo-2,5-dichlorophenyl) *O*-methyl phenylphosphonothioate (leptophos).** *Diss. Abstr. Int. B* 41(11): 4001; 1981.

Analogs of leptophos [*O*-(4-bromo-2, 5-dichlorophenyl) *O*-methyl phenylphosphonothioate] were examined for acute toxicity to mice and house flies and for delayed neurotoxic activity in adult hens following administration of a single oral dose. Development of ataxia after recovery from acute poisoning was the criterion for delayed neurotoxic activity. All mono- and dichlorophenyl analogs were delayed neurotoxic, the 2,5-dichlorophenyl analog being the most potent delayed neurotoxic compound tested. The delayed neurotoxicity of technical and purified leptophos administered orally to hens was compared under different conditions. The technical material was delayed neurotoxic at 750 mg/kg while the purified compound was delayed neurotoxic at 1000-1250 mg/kg. Definitive ataxia was questionable at 1000 mg/kg but was severe at 1250 mg/kg. The chemical composition of the technical material was analyzed for organophosphate contaminants, and impurities present at more than 0.1 percent were examined for delayed neurotoxic activity. The delayed neurotoxicity to

hens and delayed toxicity to rats of a series of trimethyl phosphates and methyl and ethyl esters of methyl-, ethyl-, and phenylphosphonates were examined. All of the *O,O*-dialkyl phosphonothioates, phosphorothioates, and their corresponding oxons were relatively nontoxic to rats, with LD_{50} values greater than the 150-450 mg/kg tested. The *O,S*-dialkyl phosphonothioate esters were highly acutely toxic. The chiral isomers of leptophos and desbromoleptophos were prepared and their toxicological properties were examined. The (R)p(+)isomers of leptophos and desbromoleptophos were more acutely toxic to the house fly and white mouse, while the (S)p(-)isomers were more delayed neurotoxic when administered ip to the hen. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 8110269)

81-2868. Sundlof, S. F. (Univ. Illinois, Urbana-Champaign, IL) **The pharmacokinetics of hexachlorobenzene in male beagles.** *Diss. Abstr. Int. B* 41(11): 4084; 1981.

The distribution, metabolism, and excretion of hexachlorobenzene (HCB) were studied in male beagle dogs. Early distribution of HCB following a single iv dose of HCB dissolved in olive oil resulted in a large percentage of the dose being trapped in the lungs. From the lungs, HCB rapidly distributed to highly perfused tissues. Disappearance of HCB from these tissues occurred rapidly between 2 and 8 hr following administration of a dose, but between 8 and 48 hr the decline in tissue concentrations occurred at a gradual rate. This biphasic decay in tissue HCB concentrations paralleled the disappearance of HCB from blood. Adipose tissue was the only tissue to accumulate HCB between 2 and 8 hr following administration of the dose. The concentration of HCB in adipose greatly exceeded the concentrations found in most other tissues. The distribution of HCB in Beagles receiving daily oral administrations of 10 or 100 mg/kg body wt HCB for 7 consecutive days also greatly favored tissues containing high fat content. The presence of metabolites of HCB could not be demonstrated in the blood or tissues of beagles receiving a single iv administration of ^{14}C-HCB. However, it was determined that 100% of urine radioactivity and > 60% of fecal radioactivity occurred as metabolites. Approximately 96% of the total radioactivity excreted in the bile was determined to be metabolites. Studies conducted to examine the excretion of HCB and HCB metabolites through urinary and fecal routes revealed that fecal excretion was the major pathway for the overall excretion of the dose. Pharmacokinetic analysis of blood, urine, and fecal radioactivity data resulted in the construction of 2 and 3 compartment models for 3 animals receiving a single iv administration of ^{14}C-HCB. By comparing the mathematical models to the experimental data generated from the distribution studies, it was concluded that the central compartment included the major body organs while the peripheral compartments were composed primarily of adipose tissue. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 8108681)

81-2869. Chopade, H. M. (North Carolina State Univ., Raleigh, NC) **Studies of the metabolism of methidathion.** *Diss. Abstr. Int. B* 41(12): 4375; 1981.

The residues and metabolism of methidathion and its secondary metabolites were studied in laboratory treated tomato fruit. The metabolites and residues of methidathion were determined for the applied doses of 1, 7, and 14 mg of methidathion/kg of tomato fruit over a 14-day period. The amount of metabolites formed was a function of the applied dose as well as the time after application. The *in vitro* metabolism of methidathion and its secondary metabolites was studied in rat and mouse liver subcellular fractions. The major route of metabolism of methidathion was via glutathione S-transferases and the major metabolite was the desmethyl methidathion. The mixed function oxidase system was also involved in the metabolism of methidathion. Thioether oxidation of the sulfide to the sulfoxide was found as the major reaction mediated by the FAD-dependent monooxygenase system. However, the oxidation of the sulfoxide to the sulfone was mediated by the P-450-dependent mixed function oxidase system and appeared as a minor pathway. The *in vitro* metabolism of methidathion by rat and mouse liver was found to be qualitatively similar; however, a few quantitative interspecies differences were evident. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 8111384)

81-2870. Mendez-Castro, F. A. (Cornell Univ., Ithaca, NY 14853) **Colonization of maize roots by a fungicide-resistant azotobacter and pseudomonad.** *Diss. Abstr. Int. B* 41(12): 4392; 1981.

A study was conducted to investigate methods of successfully establishing bacteria in the rhizosphere of maize. The possible movement of the bacteria along the roots and possible ways to keep the introduced population at high densities were also studied. Spontaneous mutants of nitrogen-fixing bacteria were isolated from a tropical Ultisol. The isolates were resistant to the fungicides captan and mancozeb and to the antibiotics spectinomycin and streptomycin. The introduction of the *Azotobacter* strain on maize seeds treated with captan (about 2 mg per seed) resulted in an increase in the number of the introduced strain. However, the native nitrogen-fixing populations also increased because the fungicide stimulated their growth instead of restraining them and promoting growth of the captan-resistant strain. Spontaneous mutants of *Pseudomonas* bacteria were isolated from Lima silt loam that had been planted with alfalfa, maize, and soybean. The isolates were resistant to mancozeb, thiram, spectinomycin, and streptomycin. When introduced into the soil on seeds of maize coated with mancozeb (2 mg per seed), *Pseudomonas* MMR51 was able to grow by utilizing plant exudates. Treatment of the seeds with mancozeb gave the introduced pseudomonad an advantage over the native community of bacteria because mancozeb was detrimental to these bacteria. The application to the seeds of mancozeb together with the pseudomonads significantly increased the

dry wt of the resulting plants compared to plants to which the treatments were applied separately. The use of spectinomycin and the fungicide terrazole in foliar sprays with urea did not significantly affect either the bacterial or the fungal communities in the rhizosphere of plants grown from seeds inoculated with *Pseudomonas* MMR51 but not treated with mancozeb. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 8110999)

81-2871. Anugwelem, U. A. (Univ. Texas H.S.C., Houston Sch. Public Health, Houston, TX) **Responses of indicator and pathogenic bacteria to the presence of carbaryl in water.** *Diss. Abstr. Int. B* 41(12): 4437; 1981.

This study was conducted to determine the effect of carbaryl on the growth and metabolic rates of bacteria used to indicate water pollution, and on pathogenic organisms which are found in polluted water. *Escherchia coli* and *Streptococcus faecalis* were used as indicators, while *Staphyloccus aureus* and *Salmonella typhimurium* were the pathogens studied. Pure and mixed cultures of these organisms were exposed to two concentrations of carbaryl (Sevin). The study demonstrated that the fecal pollution indicator organisms, *E. coli* and *S. faecalis*, respond differently to the presence of small concentrations of carbaryl in water, as do the two pathogens tested (*S. typhimurium* and *S. aureus*). The growth of all test organisms, as measured by spread plate counts, was reduced by the presence of either 1 mg/l or 5 mg/l carbaryl within a period of 8 days. Survival of the organisms in the presence of 5 mg/l carbaryl varied depending on whether the organism was in pure or mixed culture. In the presence of 5 mg/l carbaryl, both pure and mixed cultures of *E. coli* showed longer survival. *S. faecalis* survived for more than 8 days in pure culture; neither *S. typhimurium* nor *S. aureus* survived for 8 days in pure culture. The metabolic rate of *S. faecalis* and *S. aureus* was reduced by both 5 mg/l and 1 mg/l Sevin concentrations, contrary to *E. coli* and *S. typhimurium*, which had reduced metabolic rate with the introduction of 5 mg/l Sevin, but showed an increase in the metabolic rate with 1 mg/l Sevin. There was no difference between the test and control when mixed populations were exposed to 5 mg/l Sevin and the metabolic rate tested. A mixture of *E. coli* and *S. typhimurium* populations showed a respiration increase over the control when exposed to one mg/l Sevin concentration. If similar effects occur in polluted surface waters, misleading results from bacteriological water quality testing may occur. (Author abstract by permission, modified. Copies of the thesis are available from University Microfilms, order No. 8112775)

81-2872. Hansch, C. (Dep. Chem., Pomona Coll., Claremont, CA 91711) **The role of the partition coefficient in environmental toxicity.** In: *Dynamics, Exposure and Hazard Assessment of Toxic Chemicals.* Haque, R., ed. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH19: 273-286; 1980 (37 references).

Evidence for the role of the oil/water partition coefficient of organic compounds in nonspecific toxicity is discussed. It has been determined that higher partition coefficients are correlated with greater toxicity. Examples of the calculation of logs of the partition coefficient are presented. Hydrophobic interactions in simple model systems are discussed. Other topics considered include the role of hydrophobicity in the sequestering of chemicals by proteins and other material and the relationship of toxicity and mutagenicity to the partition coefficient.

81-2873. Bungay, P. M.; Dedrick, R. L.; Matthews, H. B. (Biomed. Eng. & Instrum. Branch, Natl. Inst. Health, Bethesda, MD 20014) **Pharmacokinetics of environmental contaminants.** In: *Dynamics, Exposure and Hazard Assessment of Toxic Chemicals.* Haque, R., ed. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH23: 369-377; 1980 (7 references).

Physiological modeling concepts that describe local pharmacokinetic interactions between chemicals or metabolites and other substances in the milieu are presented. These mathematical models can simulate a profile of concentrations throughout the body over time. These tools incorporate, as much as possible, known anatomical and physiological information. Models for 2 agents, hexachlorobiphenyl and Kepone (chlordecone) are discussed. Both compounds are highly chlorinated hydrocarbons, but each exhibits quite different distribution behavior. The coefficient for distribution into fat is quite low for Kepone, in contrast to that for hexachlorobiphenyl. The liver is the most important storage organ for Kepone. Kepone is eliminated from the body primarily in the feces. Kepone and its metabolites are excreted by the liver into the bile. Combined pharmacokinetic and pharmacodynamic models could prove to be a useful part of chemical hazard assessment methodologies.

81-2874. Barrows, M. E.; Petrocelli, S. R.; Macek, K. J.; Carroll, J. J. (E G & G, Bionomics Aquat. Toxicol. Lab., Wareham, MA 02571) **Bioconcentration and elimination of selected water pollutants by bluegill sunfish (*Lepomis macrochirus*).** In: *Dynamics, Exposure and Hazard Assessment of Toxic Chemicals.* Haque, R., ed. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH24: 379-392; 1980 (12 references).

The bioconcentration potential and persistence of 33 chemicals representing 14 chemical classes were studied in a representative aquatic species, the bluegill sunfish. Of the 33 chemicals, 27 were ^{14}C-labeled organic compounds, including acenaphthalene, acrolein, acrylonitrile, carbon tetrachloride, chloroform, chlorinated benzenes, chlorinated ethanes, chlorinated ethylenes,

bis(2-chloroethyl) ether, isophorone, phenols, n-nitrosodiphenylamine and phthalates. The other tested compounds included antimony trioxide, arsenic trioxide, beryllium chloride, selenous acid, silver nitrate, and thallous sulfate. At the start of each study 100 bluegills were placed into an aquarium of the appropriate test system and continuously exposed to a sublethal concentration of a ^{14}C-labeled organic compound or a metal salt in aqueous solution. Acrolein at a mean water concentration of 13.1 μg/l showed a bioconcentration factor of 344; acrylonitrile at 9.9 μg/l, 48; *O*-dichlorobenzene at 7.89 μg/l, 89; *p*-dichlorobenzene at 10.1 μg/l, 60; trichlorobenzene at 2.87 μg/l, 182; trichloroethylene at 8.023 μg/l, 17; and diethylphthalate at 9.42 μg/l, 117.

81-2875. Khan, M. A. Q.; Feroz, M.; Podowski, A. A.; Martin, L. T. (Dep. Biol. Sci., Univ. Illinois, Chicago, IL 60680) **Ecological and health effects of the photolysis products of chlorinated hydrocarbon pesticides.** In: *Dynamics, Exposure and Hazard Assessment of Toxic Chemicals.* Haque, R., ed. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH25: 393-415; 1980 (71 references).

The behavior of cyclodiene insecticides under different types of light, and the toxicity and biotransformations of their photolysis products were studied. The photoisomers of aldrin, dieldrin, heptachlor and chlordane appear to occur under natural conditions. All of these photoisomers are of special significance because they are much more toxic to certain animals than their parent compounds. For example, photoheptachlor is 264 times more toxic than heptachlor to goldfish. These compounds accumulate in body fat, gonads, liver and other tissues and have long half-lives. Their concentration in the gonads in females may have some effects on offspring. Photo-*cis*-chlordane, which is more biodegradable than *cis*-chlordane, showed higher bioaccumulation values, and therefore may have more significant effects on food chains. The photolysis of PCP and the hexachlorocyclopentadiene is also noted.

81-2876. Murphy, S. D. (Div. Toxicol., Dep. Pharmacol., Med. Sch., Univ. Texas, Houston, TX 77025) **Toxicological dynamics.** In: *Dynamics, Exposure and Hazard Assessment of Toxic Chemicals.* Haque, R., ed. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH27: 425-435; 1980 (9 references).

The principles and procedures used in assessing chemical damage at target sites or injury to nontarget biological organisms are reviewed. The major purpose of toxicological testing is to obtain data on the dose-response characteristics of a chemical. These studies provide the primary data base from which estimates of risk to an identified population or organisms may be determined in connection with specific chemical uses or disposal practices. Chemicals are categorized at different priority levels based on factors governing their apparent ability to cause toxic effects on exposure to humans or to the environment. When an experiment is intended to provide information for risk assessment, the design should include testing at various dose levels which will yield results between the 0 and 100% incidence of injury, irrespective of length of exposure, medium, source, or route of administration. Acute toxicities of some common insecticides are cited, as well as their comparative toxicities to different fish and avian species.

81-2877. Lijinsky, W. (Chem. Carcinog. Program, Frederick Cancer Res. Cent., Frederick, MD 21701) **Transport and fate of chemicals in evaluation of their carcinogenicity.** In: *Dynamics, Exposure and Hazard Assessment of Toxic Chemicals.* Haque, R., ed. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH28: 437-449; 1980 (20 references).

The transport, fate, and effect of carcinogens are considered in current decision-making about testing chemicals for carcinogenicity and in interpretation of the results of these tests. Many carcinogens induce liver tumors in rats when administered orally. It is assumed that the carcinogenic action of the compounds in the liver and not elsewhere is due to activating enzymes present only in the liver. One of the most frequent criticisms of long-term animal bioassays of chemicals for carcinogenic activity is that the large doses that are administered overload the liver enzyme systems, which detoxify these chemicals, leading to accumulation of carcinogenic insults. However, some findings suggest that a small dose of a carcinogen may more effectively increase carcinogenic risk than a larger dose (some of which may be excreted unchanged). The need for studies of metabolism and distribution of carcinogens in examining mechanisms of carcinogenesis stressed.

81-2878. Sastry, K. V.; Sharma, K. (Dep. Zool., Sch. Environ. Contam. Toxicol., D.A.V. (P.G.) Coll., Muzaffarnagar, India) **Diazinon-induced hematological changes in *Ophiocephalus (Channa) punctatus*.** *Ecotoxicol. Environ. Saf.* 5(2): 171-176; 1981 (34 references).

The blood of the teleost fish *Ophiocephalus (Channa) punctatus* was examined following administration of the LC50 (3.1 mg/l) of diazinon for 96 hr or of a sublethal concentration of diazinon (0.3 mg/l) for 15 and 30 days. At the end of the experimental periods, blood was drawn from the caudal vessel and various blood parameters were assessed. Pronounced metabolic effects of diazinon were demonstrated. While there was no marked alteration in total plasma protein, the percentage of hemoglobin and hematocrit values was increased by diazinon. Blood glucose and urea levels increased, as did concentrations of sodium, calcium, and chlorides. Cholesterol increased after 15 or 30 days. Alkaline phosphatase, but not acid phosphatase, increased. Amylase activity was decreased

following acute diazinon exposure, but increased following chronic exposure. Both acute and chronic treatments caused a reduction in cholinesterase. Possible mechanisms for these diazinon effects are discussed.

81-2879. Singh, H.; Singh, T. P. (Fish Endocrinol. Lab., Dep. Zool., Banaras Hindu Univ., Varanasi, India) **Effect of parathion and aldrin on survival, ovarian ^{32}P-uptake and gonadotrophic potency in a freshwater catfish, *Heteropneustes fossilis* (Bloch).** *Endokrinologie* 77(2): 173-178; 1981 (21 references).

The effects of parathion and aldrin on survival, ovarian activity, and gonadotrophic potencies of pituitary glands and blood serum was studied in the freshwater food fish *Heteropneustes fossilis*. In tests of survival, aldrin was found to be more toxic [LC(I)50 0.85 ppm] than parathion [LC(I)50 32 ppm]. A significant reduction was seen in ovarian ^{32}P uptake; aldrin was a much more potent suppressor of ovarian activity than parathion. When fish were exposed to the 96 hr LC(I)50 and safe concentrations of the 2 insecticides the gonadotrophic potencies in the pituitary extract and blood serum decreased significantly. These insecticides apparently retarded gonadotrophic secretion, reducing ovarian ^{32}P uptake.

81-2880. Bower, C. C.; Kaldor, J. (Agric. Res. Stn., Bathurst, New South Wales 2795, Australia) **Selectivity of five insecticides for codling moth control: effects on the twospotted spider mite and its predators.** *Environ. Entomol.* 9(1): 128-132; 1980 (18 references).

Five insecticides were tested against *Laspeyresia pomonella* (L.), and their effects on *Tetrancyus urticae* (Koch) and its predators were determined. The broad-spectrum insecticides permethrin (0.013%), azinphosmethyl (0.05%) and leptophos (0.045%) gave equal control of *L. pomonella* under a 3-weekly program of 7 sprays. Poorer control was given by the selective chemicals chlordimeform (0.05%) and diflubenzuron (0.05%). Both chlordimeform and permethrin suppressed *T. urticae* populations. No predators of mites were found on permethrin-treated trees and very few were found on trees sprayed with the organophosphates. Chlordimeform appeared relatively harmless to all stages of *Stethorus* spp. and diflubenzuron appeared harmless to *Stethorus* adults, but was toxic to the eggs. Small numbers of predatory mites of 3 species were recovered from diflubenzuron treated trees towards the end of the season. (Author abstract by permission)

81-2881. Butcher, R. L.; Page, R. D. (Dep. Obstet. Gynecol., Sch. Med., West Virginia Univ., Morgantown, WV 26506) **Introductory remarks: environmental and endogenous hazards to the female reproductive system.** *Environ. Health Perspect.* 38: 35-37; 1981 (9 references).

Some hazards from exogenous and endogenous substances on reproductive processes are discussed. Hazards include mutations and the persistence of some chemicals in the environment. Some chemicals have direct effects on conceptus. Other materials alter reproduction through actions on different organs, including the hypothalamus, pituitary, ovary, or uterus. Environmental agents, including pesticides and herbicides, that affect female reproduction are presented in tabular form. Known effects on conceptus or reproductive function are given for dioxins, PCBs, pesticides, and the herbicides 2,4-D and 2,4,5-T. Dioxins, 2,4-D, and 2,4,5-T are known to cause abortion, birth defects, and stillbirth. Other pesticides cause birth defects, mutation, neural alterations, and ovarian dysfunction. Most toxic substances entering the maternal circulation can cross the placenta and cause death, congenital malformations, growth retardation, mental deficiencies, mutations and carcinoma. When accidentally introduced into the human food chain, environmental pollutants have the potential of altering the endocrine system if chronically present in the diet.

81-2882. Loose, L. D.; Silkworth, J. B.; Charbonneau, T.; Blumenstock, F. (Pfizer Cent. Res. Labs, Groton, CT 06340) **Environmental chemical-induced macrophage dysfunction.** *Environ. Health Perspect.* 39: 79-91; 1981 (59 references).

Male Balb/c mice were fed diets containing polychlorinated biphenyl (Aroclor 1242), hexachlorobenzene, or dieldrin, at 167 ppm for 3, 6, or 18 wk. Findings indicated that these contaminants under these conditions did not significantly change in any consistent manner the oxygen utilization, phagocytic activity or microbicidal activity in phagocytic cells. However, certain individual parameters were altered, but not in any temporal pattern. The phagocytic activity, phagocytic capacity, and microbicidal activity of alveolar, splenic, and peritoneal macrophages and PMNs was not altered in any consistent manner. Fibronectin, a surface binding glycoprotein, was significantly decreased, primarily at wk 18 of testing. Tumor susceptibility of PCB 1242, HCB, and dieldrin treated syngeneic mice was assessed using an ascites form of tumor cell implant from chemical- and/or virus-transformed cell lines bearing diverse H-2 and Mls antigens. This lack of susceptibility to tumor challenge was observed with all 4 tumor models.

81-2883. Brzeznicka, E. A.; Chmielnicka, J. (Dep. Toxicol. Chem., Inst. Environ. Res. & Bioanal., Med. Acad., Narutowicza 120a, PL-90145 Lodz, Poland) **Interaction of alkylmercuric compounds with sodium selenite. I. Metabolism of ethylmercuric chloride administered alone and in combination with sodium selenite in rats.** *Environ. Health Perspect.* 39: 131-142; 1981 (61 references).

Female Wistar rats were given ethylmercuric

chloride in 0.1% sodium carbonate ig every other day for 14 days. The animals received 0.25 or 2.5 mg Hg/kg body wt/single dose. At 24 hr after the last administration the rats were sacrificed. Other groups that received the same doses of ethylmercuric chloride also received an aqueous solution of sodium selenite ig, 0.5 mg Se/kg/single dose. Selenium affected the distribution of ethylmercury among tissues and subcellular fractions of the kidneys and liver. Selenium also affected the binding of Hg to the soluble fraction proteins in these organs. Similarities and differences between the effect of interaction of sodium selenite with ethylmercuric chloride and methylmercury, as well as inorganic mercury, are also discussed.

81-2884. Dad, N. K.; Tripathi, P. S. (Environ. Biol. Unit., Sch. Stud. Zool., Vikram Univ., Ujjain 456010, India) **Acute toxicity of herbicides to freshwater fish and midge larvae, *Chironomus tentans*.** *Environ. Int.* 4(5-6): 435-437; 1980 (32 references).

The acute toxicity of Tafazine (simazine), Bladex (cyanzine), and Aresin (monolinuron) to 3 freshwater teleosts, *(Labeo rohita, Mystus vittatus,* and *Cirrhinus mrigala)* and to midge larvae *(Chironomus tentans)* was examined. Fish were exposed to the herbicides in aquaria and midge larvae in petri dishes in 24, 48, or 96 hr static toxicity tests. *L. rohita* and *C. mrigala* were susceptible to all of the herbicides tested; *M. vittatus* and *C. tentans* were susceptible to Tafazine toxicity. The toxicity of the 3 herbicides to fish and midge larvae were in the descending order of Tafazine > Bladex > Aresin. Toxic effects of the herbicide in fish included loss of equilibrium, increased opercular beating and mucous secretion, loss of color, and increased rate of excretion. The highest concentrations of herbicides caused fast erratic wriggling movements of midge larvae followed by sluggishness, loss of color, and movement to the periphery of the petri dishes near death. These findings show the adverse effects of herbicides before degradation on aquatic organisms.

81-2885. Dalela, R. C.; Rani, S.; Verma, S. R. (Pollution. Relevant Lab. Post Grad. Dep. Zool., DAV Coll., Muzaffaranagar 251001, India) **Physiological stress induced by sublethal concentrations of phenol and pentachlorophenol in *Notopterus notopterus*: hepatic acid and alkaline phosphatases and succinic dehydrogenase.** *Environ. Pollut. Ser. A* 21(1): 3-8; 1980 (21 references).

Tests were conducted to determine effects of phenol and pentachlorophenol (PCP) on the freshwater fish *Notopterus notopterus.* Fish were exposed in aquaria to 4 sublethal concentrations of phenol (90, 130, 264, and 662 μg/l) and PCP (13.6, 20.4, 40.8 and 60.2 μg/l) for 10, 20, or 30 days. After fish were sacrificed, the livers were removed, homogenized, and centrifuged. The supernatant was used for enzyme and protein analysis. In almost all cases, there was inhibition of acid and alkaline phosphatases and succinic dehydrogenase. In general, acid phosphatase was inhibited to the greatest degree, and succinic dehydrogenase the least. The highest level of inhibition (≈ 70%) was seen after 30 days treatment with either phenol or PCP. Possible mechanisms for the effects on these enzymes are discussed, but it is noted that no clear-cut explanation currently exists.

81-2886. Boyle, T. P. (Columbia Natl. Fish. Res. Lab., US Fish & Wildl. Serv., Columbia, MO 65201) **Effects of the aquatic herbicide 2,4-D DMA on the ecology of experimental ponds.** *Environ. Pollut. Ser. A* 21(1): .35-49; 1980 (26 references).

Studies were carried out to determine the effects of the herbicide dimethylamine salt of 2,4-dichlorophenoxy acetic acid (2,4-D DMA) on productivity of experimental ponds. Twelve experimental ponds (mean area 0.08 ha) were used: 4 were left untreated as controls; 4 were treated with 2,4-D DMA applied by hand sprayer at 5 kg/ha AI; and 4 were treated with 10 kg/ha. Water quality data and indices of biological productivity were evaluated for 3 wk before herbicide application and for 16 wk thereafter. In addition, laboratory experiments were conducted in which the effects of 2,4-D on batch cultures of natural phytoplankton communities were tested. It was observed that the lower concentration of 2,4-D DMA altered the pattern of primary productivity by stimulating the growth of rooted macrophytes and planktonic algae. Fish growth was enhanced by the higher application rate. This may be a direct effect of 2,4-D DMA, or may be an indirect effect due to the stimulation of phytoplanktoproductivity. Statistical analyses show that gross production in treated ponds was more highly related to planktonic chlorophyll *a* and dissolved nutrients than in the untreated ponds.

81-2887. Rudd, R. L.; Craig, R. B.; Williams, W. S. (Dep. Zool., Univ. California, Davis, CA 95616) **Trophic accumulation of DDT in a terrestrial food web.** *Environ. Pollut. Ser. A* 25(3): 219-228; 1981 (18 references).

A 13-ha plot adjacent to croplands was subjected to aerial spraying of DDT at 0.22 kg/ha. In this simplified agroecosystem, modular food-web relationships were linked with DDT residues. Analysis was made of soils, vegetation, and tissues of resident biota for total residues at regular intervals up to 2 yr subsequent to application. An immediate uptake of ΣDDT was noted in tissues of herbivores, followed by a precipitous decline and then a stabilization or slight long-term incline in concentrations. A similar pattern was initially followed by carnivorous arthropods, with an unexpected trophic increase. The timespan of uptake, however, was greatly expanded. Results indicate a 2-compartment mode of uptake, one fast and one very slow, with the latter dependent on trophic concentration alone. Time delay in carnivores must be related to trophic factors and individual life histories within the

feeding guild. Only one feeding group (shrews) demonstrated ecological hazard; shrews were totally absent from the area after application.

81-2888. Goudling, K. H.; Ellis, S. W. (Sch. Nat. Sci., Hatfield Polytechnic, Hatfield, Herts A110 9AB, England) **The interaction of DDT with two species of freshwater algae.** *Environ. Pollut. Ser. A* 25(4): 271-290; 1981 (40 references).

Studies were conducted to determine the effects of DDT on *Anabaena variabilis* and *Chlorella fusca*. DDT was added to cell cultures to give final concentrations ranging from 1 ng/ml to 1 μg/ml, and incubated for 7-14 days at a light intensity of 1500 lux. Growth was assessed as cell number, chlorophyll *a*, dry wt, or total biovolume. In tests on *Chlorella*, 1 μg/ml DDT initially reduced cell numbers by 75% after 72 hr. After 200 hr, however, treated cultures and controls had the same number of cells; eventually the number of cells in treatment cultures exceeded that of the controls. *Chlorella* chlorophyll *a* and biovolume were reduced by a greater percentage than was cell number. Controls and experimental cultures did not correspond until after 480 hr. *Anabaena* growth was not affected by DDT. Both species accumulated DDT, but *Chlorella* accumulated the highest amounts.

81-2889. Henny, C. J.; Meeker, D. L. (Patuxent Wildl. Res. Cent., Corvallis, OR 97330) **An evaluation of blood plasma for monitoring DDE in birds of prey.** *Environ. Pollut. Ser. A* 25(4): 291-304; 1981 (17 references).

A study is presented in which the blood of American kestrels was monitored for DDE. Blood samples from 20 wild trapped birds were analyzed for background DDE levels. The birds were then maintained in cages and fed 1, 5, 25, 125 or 625 ppm DDE daily for 11 days, then switched to non-treated food for an additional 13 days prior to being sacrificed. Intermediate dosage rates were studied on 8 additional birds. They were fed food with 200 and 400 ppm DDE for 11 days, then switched to non-treated food for 56 days. The results of these studies indicate a strong correlation between brain and plasma DDE levels, and a strong correlation between plasma DDE and DDE in the diet. Field studies were conducted to evaluate residue build-up due to a single spraying of DDT and to evaluate the blood plasma technique for monitoring birds of prey. Egg and plasma residues were determined for 4 species of raptors. The egg-plasma relationship appears to be species specific. One of the most valuable aspects of this procedure is prediction of the impact of plasma residues. The techniques described are intended to supplement existing methods of monitoring the impact of DDT on raptors.

81-2890. Osborn, D.; Cooke, A. S.; Freestone, S. (NERC, Inst. Terr. Ecol., Monks Wood Exp. Stn., Abbots Ripton, Huntingdon, Cambs PE17 2LS, England) **Histology of a teratogenic effect of DDT on *Rana temporaria* tadpoles.** *Environ. Pollut. Ser. A* 25(4): 305-319; 1981 (10 references).

A light microscopic investigation on frog tadpoles was designed to describe the histological characteristics of a snout abnormality caused by exposure to DDT. Stage 28 tadpoles were treated with 0.1 ppm DDT for 2 days. At various stages during the development of and recovery from the abnormality, suitable individuals were removed and fixed in Susa's fixative prior to histological evaluation. No abnormal snouts were observed among control groups; 29% of tadpoles in the treatment groups developed the snout abnormality. The abnormality was found to be caused by 2 factors: the disruptive effect DDT has on the development of skin glands in the region above the upper mandible, and the hyperactivity that DDT causes in tadpoles. Disruption of glandular development by DDT may be due to the prevention of the organization of the epithelial cells in gland units. The DDT-induced hyperactivity in the tadpoles causes the lower mandible to strike the inner surface above the upper, resulting in loss of the upper mandible. Some recovery is seen at various stages, but the mechanism of the recovery remains unknown.

81-2891. Andre, F.; Gillon, J.; Andre, C.; Jourdan, G. (Unit. Physiopathol. Dig., INSERM U 45, Hop. Edourd Herriot, Lyon, France) **Prevention of reaginic antibody production and anaphylactic gastric ulcer by pesticides and by a polychlorinated biphenyl.** *Environ. Res.* 25(2): 381-385; 1981 (14 references).

The effects of different pesticides, lindane, phosalone, and carbaryl, and of one polychlorinated biphenyl, pyralene, were studied on the development of reaginic antibody production and the formation of allergic gastric ulceration in *Mastomys natalensis* following prior sensitization and subsequent challenge with ovalbumin. The results indicate that lindane, phosalone, and pyralene have a pronounced suppressive effect on type I hypersensitivity reaction when ingested orally. These results give further cause for concern about the hazards to health which might result from continued indiscriminate use of such substances.

81-2892. Winterbourn, C. C. (Dep. Clin. Biochem., Christchurch Hosp., Christchurch, New Zealand) **Production of hydroxyl radicals from paraquat radicals and H_2O_2.** *FEBS Lett.* 128(2): 339-342; 1981 (17 references).

A reaction which may play an important role in paraquat toxicity is described. The reaction studied produces the radical $OH^{\cdot}$: $PQ^{+} + H_2O_2$ $PQ^{2+} + OH^{-} + OH^{\cdot}$. Paraquat radicals were generated by the reaction of xanthine oxidase with xanthine and paraquat. The reactions were carried out at ~ 28°C in closed tubes of phosphate

buffer containing methional and H_2O_2. Ethylene, which usually indicates $OH^{\cdot}$ production, was generated from methional. A metal catalyst was not required for the reaction, and the reaction was very fast. The possible role of $OH^{\cdot}$ production in the mechanism of paraquat toxicity is discussed.

81-2893. Youngman, R. J.; Elstner, E. F. (Inst. Bot. & Mikrobiol., Technische Univ. Munchen, D-8000 Munich 2, BRD) **Oxygen species in paraquat toxicity: the crypto-OH radical.** *FEBS Lett.* 129(2): 265-268; 1981 (35 references).

The oxygen species involved in reactions of paraquat was studied. The coupling of formation of ethylene from methionine in the presence of pyridoxal phosphate to another reaction which produces reduced paraquat constitutes a model system that can be used to investigate the reactions of active oxygen species. The findings demonstrate that under certain oxygen tensions, ethylene formation from methionine and pyridoxal phosphate can be mediated by paraquat, as has been shown with other redox compounds. The inhibition of ethylene formation by catalase and the lack of an effect with SOD indicates that the oxidant of methionine was derived from reduced paraquat and hydrogen peroxide. The formation of an active oxygen species which mimics the free OH radical, but is more discriminating in its reactions, is proposed. This is referred to as the crypto-OH radical. Crypto-OH radical formation would occur only under oxygen limiting conditions. Crypto-OH radical formation probably accounts for only part of the herbicidal activity of paraquat. It is suggested that certain areas of the lung with decreased oxygen levels allow crypto-OH radicals to be produced, which would account for the toxic action of paraquat.

81-2894. Engelhardt, G.; Ziegler, W.; Wallnoefer, P. R.; Oehlmann, L.; Wagner, K. (Bayerische Landesanst. Vodenkultur & Pflanzenbau, Abt. Pflanzenschutz, D-8000 Munich 19, BRD) **Degradation of azinphos-methyl by *Pseudomonas fluorescens* DSM 1976.** *FEMS Microbiol. Lett.* 11((2-3): 165-169; 1981 (8 references).

The degradation of azinphos-methyl by cultures of *Pseudomonas fluorescens* DSM 1976 is described with particular emphasis on the nature of the degradation products. Screening a variety of stock cultures of soil bacteria belonging to the genera *Pseudomonas, Nocardia, Arthrobacter, Corynebacterium, Brevibacterium,* and *Bacillus* for degradation of azinphos-methyl showed that nearly all strains transformed the insecticide to several different metabolites. During growth of the bacterium *P. fluorescens* on 4 g/l disodium fumarate, 0.1 mmol/l azinphos-methyl was metabolized almost completely within 15 days. About 34% of the ^{14}C activity was extractable with dichloromethane, whereas 57% remained in the acidified aqueous layer. The ^{14}C activity of the dichloromethane fraction consisted of the 3 major metabolites; bis(benzazimidyl- methyl)-disulfide, benzazimide, and anthranilic acid. In the aqueous layer additional anthranilic acid and a more polar product were detected. It was concluded that *P. fluorescens* is able to degrade the organophosphorus insecticide, azinphos-methyl.

81-2895. Badhaeva, L. N. (All-Union Sci. Res. Inst. Hyg. & Toxicol. Pestic, Kiev, USSR) **Experimental study of the postnatal neurotoxic effect of chloro-organic pesticides.** *Folia Morphol. (Prague)* 29(2): 113-114; 1981.

The toxic effects of toxaphene and dilor on nerve fibers, neurons, spinal synapse and heart of pregnant rats and their offspring were studied. Doses of toxaphene and dilor equivalent to 0.05 and 0.01 LD50 were administered on day 1 or days 6-14 of gestation. Dams and their offspring were examined on days 14 and 21 of gestation, and 1 mo after birth. Toxaphene treatment from the first day of pregnancy resulted in a higher embryonic death rate than treatment between days 6 and 14. Low-dose dilor treatment resulted in increased embryonic death, changes in wt of newborns, cerebral edema, extravasations of heart, kidney, and adrenal blood, and pigment of the claws. The higher dose treatment caused retarded differentiation of the nervous structure of the heart and cerebellum and the skeletal muscles. Toxaphene treatment also resulted in disturbances of the heart.

81-2896. Westphal, D.; Lucas, K.; Hilbig, V. (Max von Pettenkofer-Inst. Bundesgesundheitsamtes, D-1000 Berlin 33, BRD) **Studies of the arylhydroxylation of monochlorophenylureas in the isolated perfused rat liver.** *Food Cosmet. Toxicol.* 19(3): 341-345; 1981 (19 references).

Biotransformation studies with phenylurea and the 3 isomers of monochlorophenylurea were performed using an isolated perfused rat-liver preparation. In the perfusate and the bile, ring-hydroxylation was detected only with phenylurea and with *o*- and *m*-chlorophenylurea, and yielded the corresponding *p*-hydroxylated compounds in each case, while with *p*-chlorophenylurea no ring hydroxylation was observed at the ortho or meta position. Similar results were obtained with the arylhydroxylation of the herbicide monolinuron (3-(4-chlorophenyl) -1-methoxy-1-methylurea) in the perfused rat liver. In contrast, studies of monolinuron biotransformation *in vivo* in rats, pigs and hens showed that ring hydroxylation at the ortho or meta position was the main degradation step. The possible reasons for the difference in biotransformation *in vivo* and *in vitro* are discussed. (Author abstract by permission)

81-2897. Pelissier, M. A.; Faudemay, F.; Dooh-Priso, E.; Atteba, S.; Albrecht, R. (Lab. Biol. Conserv. Natl. Arts & Metiers, U 177 INSERM, F-75141 Paris Cedex 03, France) **Diminution par un dithiocarbamate fongicide, le**

zinebe, de l'activite des oxygenases microsomales du foie chez la rat: effets d'un regime a 9% de caseine. [Decrease in the activity of microsomal oxygenases in rat liver by the dithiocarbamate fungicide zineb: effects of a diet containing 9% casein.] *Food Cosmet. Toxicol.* 19(3): 357-360; 1981 (25 references) (French).

Young male rats were fed a balanced diet or one containing 9% casein. After 2 wk, each group was divided, one half being maintained as the control and the other half being fed diet containing zineb, zinc 1,2-ethylenebis(dithiocarbamate), at a level of 600 ppm (of the pure product) for 4 wk. The low-protein diet lowered the activities of aminopyrine *N*-demethylase (APDM) and NADPH-cytochrome *c* reductase expressed in relation to protein, but increased their molecular activities per unit of P-450. The protein-deficient diet had no effect on the specific activity of aniline hydroxylase (AH), but increased the activity per unit of P-450. It also reduced the levels of cytochromes P-450 and b_5. Rats on this diet showed a prolonged hexobarbital-induced sleeping time. Ingestion of zineb lowered the activities of APDM and AH, calculated on the basis of protein, but had no effect on their activities expressed in terms of P-450 units. The treatment did not modify the cytochrome P-450 and b_5 levels significantly, nor the activity of NADPH-cytochrome *c* reductase. The fungicide augmented the hexobarbital-induced sleeping time. The low-protein diet did not modify the effects of zineb on the microsomal oxygenases or *vice versa*, so the zineb-treated rat fed on a deficient diet metabolizes xenobiotics very slowly. (Author abstract by permission)

81-2898. Papst, M. H.; Boyer, M. G. (Freshwater Inst., Winnipeg, Manitoba R3T 2N6, Canada) **Effects of two organophosphorus insecticides on the chlorophyll *a* and pheopigment concentrations of standing ponds.** *Hydrobiologia* 69(3): 245-250; 1980 (14 references).

Chlorophyll *a* measurements were taken as an index of total phytoplankton, and these measurements used to follow changes in biomass in treated and untreated ponds. The ponds were polyethylene lined depressions measuring 2 × 2 × 1 m, containing about 3000 *l* of water and activated by the introduction of a standard quantity of leaf litter from mosquito-containing woodland ponds. The insecticides Abate (temephos) and Dursban (chlorpyrifos) were applied as emulsion formulations at concentrations designed to yield 0.01 ppm AI, except for 1 pond which was treated with a granular formulation of Abate. Concentrations of Abate in this pond exceeded 10 ppm. An increase in algal biomass was noted after treatment. Algal blooms were composed of mixed planktonic forms, mainly *Volvox aureus, Glenodinium* sp., *Kirchneriella contorta, Ankistrodesmus falcatus, Dictyosphaerium* sp., and *Dinobryon* sp. The dominant macrozooplankton in all ponds was *Daphnia pulex*. A *Diaptomus* sp. was the second most abundant but did not comprise more than 10% of the population at any time. Release from predatory activity appeared to be a major aspect of post-treatment algae increases.

81-2899. Golovleva, L. A.; Finkel'shtein, Z. I.; Popovich, N. A.; Skryabin, G. K. (Inst. Biochem. Physiol. Microorg., Acad. Sci., Pushchino, USSR) **Prevrashchenie ordrama mikroorganizmami. [Conversion of Ordram by microorganisms.]** *Izv. Akad. Nauk SSSR Ser. Biol.* (3): 348-357; 1981 (10 references) (Russian).

Data were presented from long-term research on the effect of the thiocarbamate herbicide Ordram (molinate) on the following natural reservoir microflora: *Nocardia* sp., *Arthrobacter pascens, Acinetobacter calcoaceticum, Corynebacterium* sp., *Hyphomicrobium* sp., *Mycobacterium marinum, Curtobacterium* sp., *Bacillus sp., Enterobacter* sp., *N. globerula*, and *N. pellegrini*. Ordram conversion did not have a marked effect on the abundance of aquatic microflora, but strongly affected the species composition. Under natural conditions, inadequate aeration, low temperature, and low content of organic matter and salts markedly retarded Ordram degradation. Addition of certain supplementary substrates intensified activity of natural microflora with respect to Ordram. The pathway of microbial transformation of Ordram by pure microorganism cultures was established. Analogous transformation products were observed under natural conditions, and some were more persistent than the initial herbicide and possessed greater toxicity for warm-blooded animals. However, the LD50 values of the main metabolites did not exceed permissible standards, and use of Ordram is not hazardous to humans and the environment.

81-2900. Akhtar, M. H.; Foster, T. S. (Anim. Res. Cent., Res. Branch, Agric. Canada, Ottawa, Ontario K1A 0C6, Canada) **Tetrachlorvinphos metabolism in laying hens.** *J. Agric. Food Chem.* 29(4): 766-771; 1981 (15 references).

Tetrachlorvinphos metabolism was studied, with the aid of a ^{14}C-labeled compound, in laying hens fed 50 ppm of the insecticide. Approximately 71% of the radioactivity was eliminated in 24 hr in excreta. After the final dose, an additional 1.3 and 2.6% of total ^{14}C was excreted during the next 3 and 7 days. Eggs laid within 24 hr of the treatment contained radioactivity. ^{14}C was also detected in tissues and organs at an insecticide equivalent in the ppm range in kidney, liver, and abdominal fat but in the ppb range elsewhere. After dosing was discontinued, the ^{14}C content of excreta, eggs, tissues, and organs gradually decreased. Compounds identified in excreta were desmethyl tetrachlorvinphos (25%), 2,4,5-trichloromandelic acid (30.5%), and tetrachlorvinphos (1.0%). During the treatment period, all tissues examined contained small amounts of the insecticide, but only traces were detected in tissues and organs from hens killed 7 days after the last dose. (Author abstract reprinted by permission of the American Chemical Society)

81-2901. Westlake, G. E.; Bunyan, P. J.; Martin, A. D.; Stanley, P. I.; Steed, L. C. (Tolworth Lab., Agric. Sci.

Serv., Minist. Agric. Fish. & Food, Tolworth, Surbiton, Surrey KT6 7NF, England) **Organophosphate poisoning. Effects of selected organophosphate pesticides on plasma enzymes and brain esterases of Japanese quail (*Coturnix coturnix japonica*).** *J. Agric. Food Chem.* 29(4): 772-778; 1981 (29 references).

Lethal and sublethal doses (0.33 or 0.5 × LD50, LD50, and 2 or 3 × LD50) of 5 widely used organophosphate pesticides (carbophenothion, chlorfenvinphos, dimethoate, pirimiphos ethyl, and pirimiphos methyl) were administered to Japanese quail. Acetylcholinesterase (AChE), cholinesterase (ChE), and α-naphthyl acetate esterase activities were measured in plasma after 2 and 24 hr or at death. AChE activities were measured in fresh brain extracts and after 7 days post-mortem. The tissue-specific enzymes glutamate dehydrogenase (GDH), glutamate oxaloacetate transaminase (GOT), and sorbitol dehydrogenase were also measured in the plasma after 2 and 24 hr or at death. Both plasma AChE and ChE gave a dose-response relationship at 2 hr, surviving quail at 24 hr generally exhibiting less inhibition. Lethally dosed quail showed 80-85% inhibition of plasma AChE and > 95% inhibition of plasma ChE. Brain AChE gave a dose-response relationship in quail that died within 2 hr with the exception of the chlorfenvinphos-treated groups which all exhibited maximum inhibition. This relationship remained in survivors from the carbophenothion, dimethoate, and pirimiphos methyl treatments at 24 hr. The administration of lethal doses to quail produced > 60% inhibition of brain AChE activity. Plasma GOT was elevated in all quail surviving carbophenothion and pirimiphos methyl treatments at 24 hr. Only carbophenothion administration gave a progressive elevation of GDH at both 2 and 24 hr. Carbophenothion and pirimiphos methyl administration resulted in longer periods of plasma esterase inhibition than the other organophosphates and also producted the largest increases in plasma GOT at 24 hr. (Author abstract reprinted by permission of the American Chemical Society)

81-2902. Westlake, G. E.; Bunyan, P. J.; Martin, A. D.; Stanley, P. I.; Steed, L. C. (Tolworth Lab., Agric. Sci. Serv., Minist. Agric. Fish. & Food, Tolworth, Surbiton, Surrey KT6 7NF, England) **Carbamate poisoning. Effects of selected carbamate pesticides on plasma enzymes and brain esterases of Japanese quail (*Coturnix coturnix japonica*).** *J. Agric. Food Chem.* 29(4): 779-785; 1981 (25 references).

Lethal and sublethal doses (0.33 or 0.5 × LD50, LD50, and 2 or 3 × LD50) of 5 commonly used carbamate pesticides (aldicarb, methiocarb, oxamyl, pirimicarb, and thiofanox) were administered to Japanese quail. Acetylcholinesterase (AChE), cholinesterase (ChE), and α-naphthyl acetate esterase activities were measured in plasma at 2 and 24 hr or at death. Brain AChE activities were measured in fresh tissue extracts and after 7 days post-mortem. Tissue-specific enzymes glutamate dehydrogenase (GDH), glutamate oxaloacetate transaminase (GOT), and sorbitol dehydrogenase were also measured in the plasma at 2 and 24 hr or at death. Lethal doses of carbamates gave > 64% inhibition of plasma AChE and > 75% inhibition of plasma ChE. Plasma esterase activities at 24 hr after dosing generally returned to control levels or above. Lethal doses of carbamates produced ~ 40-60% inhibition of brain AChE although the maximal inhibition for pirimicarb treatment was 97%. A dose-response relationship for brain AChE was only found in lethally dosed quail given oxamyl and pirimicarb. No birds surviving the carbamate treatments at 24 hr showed significant inhibition of brain AChE, and birds surviving doses of aldicarb, methiocarb, and pirimicarb showed elevated esterase levels. After 24 hr, increases in plasma GOT levels were observed in survivors from all the carbamate treatments. Elevation in plasma GDH levels were observed only in survivors from the aldicarb treatments. The changes resulting from sublethal carbamate dosing are discussed and compared with the responses obtained on dosing organophosphate pesticides to Japanese quail. (Author abstract reprinted by permission of the American Chemical Society)

81-2903. Anonymous **Toxic flea repellent reported.** *J. Am. Vet. Med. Assoc.* 179(3): 212; 1981.

Cases of hypersensitivity, ataxia, posterior weakness, and death were reported in dogs and cats in Florida during the past yr. The common factor was the flea repellent Flee. The repellent is labeled for oral and topical administration. Active agents are alkanolamines, and it may contain diethanolamine and triethanolamine separately or in combination. Both agents adversely affect the liver, pancreas, and nervous system, and may combine with nitrites to become mutagenic.

81-2904. Ivey, M. C.; Palmer, J. S. (Vet. Toxicol. & Entomol. Res. Lab., Agric. Res., SEA, USDA, College Station, TX 77840) **Chlorpyrifos and 3,5,6-trichloro-2-pyridinol: residues in the body tissues of sheep treated with chlorpyrifos for sheep ked control.** *J. Econ. Entomol.* 74(2): 136-137; 1981 (1 reference).

Residues of the insecticide chlorpyrifos and its metabolite pyridinol, 3,5,6-trichloro-2-pyridinol, were determined in omental fat, muscle, liver, and kidney tissues of sheep at weekly intervals after they had been treated with Dursban 44 Insecticide Formulation (43.2% chlorpyrifos) at the rate of 1 ml/22.68 kg (50 lb) of body wt as a pour-on application for control of *Melophagus ovinus* (L.). Chlorpyrifos residues were found in fat samples taken throughout the 6 wk post-treatment period but were not found in liver tissue and in muscle and kidney tissues after 2 wk post-treatment. Pyridinol residues were found in fat and muscle tissues for 3 wk and in liver and kidney tissues throughout the slaughter period. No adverse effects to the animals resulted from this type of treatment. (Author abstract by permission)

81-2905. Hesselberg, R. J.; Nicholson, L. W. (Great Lakes Fish. Lab., US Fish & Wild. Serv., Ann Arbor, MI 48105) **Influence of PCBs in water on uptake and elimination of DDT and DDE by lake trout.** *J. Environ. Qual.* 10(3): 315-318; 1981 (13 references).

Researchers predicted that several hundred years would be required before DDT and its metabolites were likely to decrease to nondetectable levels in Lake Michigan. But following the ban on DDT in 1970, residues of total DDT in Lake Michigan lake trout (*Salvelinus namaycush*) declined rapidly from 10.5 μg/g in 1970 to 5.7 μg/g in 1976. During this period, polychlorinated biphenyls (PCBs) were being detected in lake trout tissues at about 20 μg/g. It was hypothesized that the high level of PCBs being accumulated by fish may have influenced uptake and elimination of DDT and DDE by fish. To test this hypothesis, fingerling lake trout were exposed to various combinations of DDT, DDE (100 ng/l), and PCBs (100 and 500 ng/l) in water for 12 wk. After DDT and DDE exposures were completed, exposure to PCBs was continued for an additional 16 wk to measure any effect PCBs may have on the elimination of DDT and DDE by fish. Accumulation and elimination rates of DDT and DDE were compared. It was found that PCBs did not influence the accumulation or elimination rates of DDT or DDE in lake trout and therefore should not have had a major influence on the decline of DDT in lake trout. (Author abstract by permission)

81-2906. Moon, R. E.; Martin, D. F. (Chem. & Environ. Manage. Serv. Cent., Dep. Chem., Univ. South Florida, Tampa, FL 33620) **Effects of 2- and 4-hydroxybiphenyl on cultures of the red tide organism *Ptychodiscus brevis*.** *J. Environ. Sci. Health B* 16(4): 381-386; 1981 (18 references).

Two metabolic products of biphenyl, 4-hydroxybiphenyl and 2-hydroxybiphenyl, were studied for their effects on cultures of the Florida red tide organism *Ptychodiscus brevis* in laboratory bioassays. Both compounds were cytolytic to the dynoflagellate with LD50 values between 1 and 2 ppm. The LD50 value for 4-hydroxybiphenyl was slightly lower than that for 2-hydroxybiphenyl under the conditions of the assay, which measured the extent of lysis by Coulter counter within a 20 hr period. Both metabolites displayed a saturation effect at concentrations above 2 ppm. Possible cytolytic mechanisms are discussed.

81-2907. Kundu, B. S.; Bardiya, M. C.; Dhamus, S. S.; Tauro, P. (Dep. Microbiol., Haryana Agric. Univ., Hissar 125004, India) **Effect of fungitoxicants on grape must fermentation and wine yeast growth.** *J. Food Sci. Technol.* 18(1): 20-22; 1981 (14 references).

A 2-yr study was conducted to examine the effects of various fungicides on the growth of *Saccharomyces cerevisiae* wine yeasts and grape fermentation when sprayed on Beauty Seedless (*Vitis vinifera* L.) grapes for control of pathogenic fungi. Difolotan (captafol), Bavistin (carbendazim), Calixin (tridemorph) and Sclex (dichlozoline) were sprayed on grape vines as 0.2% formulations at rates of 2 l/vine 40 days before harvest in 1975. In 1976, Dithane M-45 (mancozeb), and Miltox (zineb) replaced Calixin and Sclex. Wine yeasts were incubated *in vitro* with 0.1, 1, 10 or 100 ppm of the fungicides in sterilized YNB broth, and their growth was checked after 24 hr by optical density measurements. Only Difolotan affected the rate of fermentation; however, the gross chemical composition of the wine remained unchanged. All 6 fungicides inhibited the growth of wine yeast when present at levels greater than 10 ppm. Difolotan, which was 10 times more toxic than the other compounds, inhibited *S. cerevisiae* at all concentrations tested.

81-2908. Pugh, G. J. F.; Smith, S. N. (Dep. Biol. Sci., Univ. Aston, Gosta Green B4 7ET, England) **Evaluation of the effects of biocides on soil microbial biomass and activity.** *J. Sci. Food Agric.* 32(6): 627-628; 1981 (2 references).

Soil samples amended with pesticides or removed directly from sites exposed to toxic chemicals were evaluated for dehydrogenase activity by a respiratory-based technique. Soil microbial biomass and composition were also determined. The ratio of bacteria:fungi was calculated in the soil microbial biomass. Trichlorophenoxyacetic acid (2,4,5-T) and paraquat had no significant effect on the soil dehydrogenase activity immediately after application. However, after 12 wk, the activity of this enzyme was significantly reduced. No concomitant reduction of microorganisms was found in soil samples, but adjacent unpolluted sites demonstrated greatly increased dehydrogenase activities and increased numbers of microorganisms. Soil biomass was also reduced in pesticide treated soils. Captan, thiram and verdasan significantly reduced soil biomass. Verdasan, an organomercury fungicide, also shifted the bacterial:fungal ratio in favor of the bacteria. In captan and thiram amended soils, levels of biomass recovered within 8 days. At concentrations 10 times that of normal field application, all fungicides reduced the biomass and changed the bacterial:fungal ratio in favor of the bacteria. Soil respiratory-based tests of dehydrogenase activity may be useful in determining the effect of toxic materials when used in combination with measurements of soil biomass and bacteria:fungi ratios.

81-2909. Lynch, J. M.; Penn, D. J.; Gussin, E. J. (Agric. Res. Counc., Letcombe Lab., Oxon OX12 9JT, England) **Microbiological problems from the decomposition of grass and weed residues following herbicide application.** *J. Sci. Food Agric.* 32(6): 628-629; 1981 (3 references).

Retarded plant growth after use of herbicides to kill dense infestations of couch grass has been observed. Possible explanations include residual herbicides in soil or plants, nutrient deficiency, microbial production of toxins, and stimulation of parasitic microbes and insects. To investigate this problem live or heat- or herbicide-killed couch grass rhizomes were sown into potting soil to test the effects on the growth of gnotobiotic barley seedlings in laboratory experiments. The presence of live couch grass rhizomes in soil retarded plant growth, but the most severe damage occurred with dead rhizomes, whether heat-killed or herbicide-killed. This effect was greatest in dry soil treated with N fertilizer. The maximal effect was observed after the rhizomes were allowed to decay for 5 wk. Minimal effects on plant growth were observed after a rhizome decay period of 7 wk. Steam-volatile fatty acids were produced during the anaerobic decay. *Fusarium culmorum*, an important colonizer of rhizomes, reduced plant growth. Species of couch grass which produced the greatest concentrations of organic acids produced the most inhibition of germination and seedling development. *Fusarium* isolated from decaying grasses retarded plant growth in sand cultures. The relative roles of organic acids and pathogens during grass decay is still uncertain, but both may play a part in the inhibition of crop growth.

81-2910. Flickinger, E. L.; King, K. A.; Stout, W. F.; Mohn, M. M. (Patuxent Wildl. Res. Cent., Gulf Coast Field Stn., US Fish & Wildl. Serv., Victoria, TX 77901) **Wildlife hazards from Furadan 3G applications to rice in Texas.** *J. Wildl. Manage.* 44(1): 190-197; 1980 (10 references).

Mortality of birds, fish, frogs, crayfish, earthworms, and nontarget insects occurred in rice fields after treatment of Furadan 3G granules in 3 Texas counties in 1970 and 1973-75. Three western sandpipers (*Ereunetes mauri*), 1 pectoral sandpiper (*Erolia melanotos*), and 2 red-winged blackbirds (*Agelaius phoeniceus*) were found dead or moribund between 17 and 24 hr after treatment. Cricket frogs (*Acris crepitans blanchardi*) were intoxicated 15 min post-treatment, and mosquito fish (*Gambusia affinis*) showed effects 1 hr post-treatment. Mortality of mosquito fish, Gulf menhaden (*Brevoortia patronus*), Atlantic croaker (*Micropogon undulatus*), and European carp (*Cyprinus carpio*) usually occurred between 24 and 28 hr after treatment. Mortality of frogs, crayfish, and nontarget insects generally occurred in rice field water between 1 and 45 hr after treatment. Mortality of earthworms in soil persisted for 52 hr. As a replacement for aldrin in Texas rice fields, Furadan 3G appeared to cause less mortality of birds than aldrin, but Furadan 3G was toxic to birds, fish, and invertebrates. (Author abstract by permission)

81-2911. Hill, E. F.; Mendenhall, V. M. (Patuxent Wildl. Res. Cent., US Fish & Wildl. Serv., Laurel, MD 20811) **Secondary poisoning of barn owls with famphur, an organophosphate insecticide.** *J. Wildl. Manage.* 44(3): 676-681; 1980 (14 references).

Twenty adult barn owls were assigned to 1 of 4 10-day treatments, 5/group. In group 1, owls were fed untreated quail. Group 2 owls were fed quail treated with 1.0 mg famphur over 3 days po. Group 3 owls were fed quail treated with famphur, as in group 2. A 150 μl blood sample was taken from each owl every 2nd day for monitoring of cholinesterase activity. Group 4 owls were given quail treated with famphur, as in group 2, but with the digestive tract removed from the quail. No difference was noted between treatment groups in acceptance or in quantity of quail eaten/unit body wt. Digestive tracts of intact quails were equally acceptable to owls in all treatment groups. By the 10th feeding all owls had inhibited ChE activity, but none exhibited overt signs of intoxication or abnormal feeding behavior during the study. Owls in group 4 had ChE activity levels intermediate between those of groups 1 and 3.

81-2912. Orndorff, S. A.; Colwell, R. R. (Westvaco Res. Lab., Laurel, MD 02810) **Effect of Kepone on estuarine microbial activity.** *Microb. Ecol.* 6(4): 357-368; 1980 (20 references).

Chesapeake Bay water samples spiked with different levels of Kepone (chlordecone) were evaluated for total numbers of actively metabolizing estuarine bacteria. At Kepone levels of ≤ 0.01 mg/l, no significant changes in *in situ* heterotrophic uptake of mixed ^{14}C-amino acids and direct viable cell (DVC) counts were observed. Maximum inhibition of heterotrophic uptake (about 85-90%) and DVC count (45-97%) were found at Kepone levels > 0.2 mg/l. Statistical correlations were found between a specific activity index (metabolic activity/DVC or Kepone-resistant DVC), heterotrophic uptake, and DVC count. These parameters were negatively correlated with Kepone concentrations in estuarine water samples. The direct viable cell count is suggested for use as a simple, rapid and accurate method for calculating the effect of Kepone on *in situ* estuarine microbial activity.

81-2913. Imperato, C.; Ferrante, E. (Inst. Clin. Pediatr., Cattedra Clin. Pediatr., Univ. Studi Roma, Rome, Italy) **Farmaci ed inquinanti ambientali nel latte di donna. [Drugs and environmental pollutants in maternal milk.]** *Minerva Pediatr.* 33(9): 377-384; 1981 (55 references) (Italian).

The intake, transport and metabolism of extraneous substances by the body of a nursing mother, their excretion in maternal milk, and the changes in the nursed infant from drugs and environmental pollutants contained in the milk, are discussed. The following substances are considered: analgesics, antibiotics, anticoagulants, sedatives, diuretics, laxatives, hormonal preparations, radioactive isotopes, a variety of other drugs, nicotine,

marijuana, heroin, alcohol, pesticides, PCBs, hexachlorobenzene, mercury, and lead. The penetration of substances into milk is a function of their molecular wt, the difference between the pH of the plasma and the milk, the degree of ionization, hydro- or liposolubility, blood flow in the mammary gland, and composition of the milk. Environmental pollutants such as DDT, lead, and PCBs in milk present a special danger to nursed infants.

81-2914. Maliwal, B. P.; Guthrie, F. E. (Toxicol. Program, Dep. Entomol., North Carolina State Univ., Raleigh, NC 27650) **Interaction of insecticides with human serum albumin.** *Mol. Pharmacol.* 20(1): 138-144; 1981 (30 references).

Carbamate, organophosphate and organchlorine pesticides were tested in equilibrium dialysis, difference spectra analysis and fluorescence tests for binding to human serum albumin at pH 7.0 at 16 and 26°C. One high affinity binding site and several other sites of moderate affinity, were found. The binding affinity was inversely related to the aqueous solubility of the insecticides tested. It was only weakly temperature dependent, and primarily of a hydrophobic nature. Long wavelength shifts in the tyrosyl and tryptophyl absorption spectra occurred upon binding. The possibility of binding-induced conformational changes in these residues was discussed. It was suggested that binding sites are in the regions which are formed by interactions between hydrophobic surfaces of several domains of albumin.

81-2915. Carere, A.; Morpurgo, G. (Ist. Super. Sanita, Rome, Italy) **Comparison of the mutagenic activity of pesticides in different *in vitro* short-term assays.** *Mutat. Res.* 85(4): 217; 1981.

The mutagenic activity of 43 pesticides was assayed in a battery of *in vitro* tests. The battery includes: induction of gene mutations in procaryotic organisms (*S. typhimurium* and *S. coelicolor*) with forward- and back-mutation systems; induction of gene mutations, mitotic crossing-over and non-disjunction in *A. nidulans*; and UDS in EUE cell cultures. Of the pesticides tested, 55% were found mutagenic in at least 1 genetic system. In some cases the relationship between chemical structure and genetic activity was also investigated. For 5 pesticides the effects of *in vitro* plant metabolism was studied in *A. nidulans*. The results obtained allow the following considerations: a single test system, even if highly sensitive, is not sufficient to fulfill the difficult task of detecting potential mutagens and/or carcinogens; it is important to use both forward- and back-mutation systems; very promising is the analysis of mitotic segregation in *A nidulans*, although the extrapolation to higher organisms is still to be elucidated in the case of non-disjunction; and plant metabolism can be responsible for the mutagenic activity. (Author abstract by permission, modified)

81-2916. Kappas, A. (Biol. Dep., Nucl. Res. Cent. Democritus, Athens, Greece) **The genotoxicity of benomyl.** *Mutat. Res.* 85(4): 219; 1981.

The group of systemic benzimidazole fungicides, among which benomyl (methyl-1-(butylcarbamoyl)-2-benzimidazole carbamate) is the most important, has generated considerable interest because of its outstanding plant disease control. A number of investigations have shown that benomyl and its breakdown product MBC (methyl-2-benzimidazole carbamate) induce several types of genetic damage including chromosomal aberrations in plants and mammalian cell cultures, point mutations in bacteria and fungi as a rather novel type of mutagen, and disturbances in cell division. This last effect, the most dramatic one, was first demonstrated in *Aspergillus nidulans* and it was shown to be caused by non-disjunction which seems to be also the mechanism of the toxicity of the fungicide. Further genetical, cytological and biochemical investigations have indicated that benomyl is a strong antimitotic agent which seems to interfere with the microtubule proteins of the cells. (Author abstract by permission)

81-2917. Legator, M. S. (Dep. Prev. Med. & Commun. Health, Div. Environ. Toxicol., Univ. Texas Med. Branch, Galveston, TX 77550) **Mutagenicity of captan.** *Mutat. Res.* 85(4): 220; 1981.

In a series of *in vitro* studies encompassing both point mutations and cytogenetic abnormalities, captan has yielded positive results. In animal studies, however, where host-mediated, metaphase analysis, and dominant lethal studies have been performed, the results have been equivocal or negative. Given the preponderance of negative animal studies, one may well conclude that this fungicide produces metabolites which are inactivated in mammals and, therefore, do not present a health hazard. The results from lifetime cancer studies in rodents may, however, indicate that the chemical is an active mutagen and the proper procedure to detect activity in the animal has yet to be constructed. (Author abstract by permission)

81-2918. Ramel, C. (Wallenberg Lab., Univ. Stockholm, S-106 91 Stockholm, Sweden) **Does dichlorvos constitute a genotoxic hazard?** *Mutat. Res.* 85(4): 222; 1981.

Dichlorvos has a worldwide use as an insecticide. It is primarily applied as resin strips, which continuously emit vapor of dichlorvos. This use implies that people are exposed to the same concentrations as the target insects. The extensive exposure of people to dichlorvos has necessitated a rigorous control of long term effects, in particular mutagenic and carcinogenic hazards. The biotransformation proceeds along 2 pathways, demethylation and esterase catalyzed hydrolysis. The demethylation is predominant in microorganisms and is responsible for mutations induced in bacteria. In mammals hydrolysis is

predominant and results in the transient formation of dichloroacetaldehyde, which has been reported as a mutagen in mammals. The evaluation of the possible genotoxic risks of dichlorvos must be based on a thorough knowledge of exposure, biotransformation, mutagenicity and carcinogenicity of dichlorvos. Whether the extensive experimental data on dichlorvos can be considered sufficient to eliminate an unacceptable genotoxic risk must be founded on a quantitative risk estimate. The outcome of this evaluation will no doubt create a precedent for the regulatory handling of genotoxic chemicals in general and may therefore be of great importance. (Author abstract by permission)

81-2919. Venitt, S. (Dep. Biochem., Warsaw Med. Sch., Banacha 1, PL-02-097 Warsaw, Poland) **The mutagenicity of the fungicide thiram.** *Mutat. Res.* 85(4): 223-224; 1981 (1 reference).

Many pesticides have been evaluated for possible mutagenicity. Since these compounds may contaminate some foodstuffs, it is imperative to know the hazards associated with their use. Thiram (bis(dimethylthiocarbamoyl) disulfide), an important member of the dimethyldithiocarbamate class of fungicides, which is widely used in agriculture, was found to have mutagenic activity in the *Salmonella* Ames system. To study the capacity of thiram to damage DNA, the repair test in *Salmonella typhimurium* (strains TA1538 and TA1978) and a new assay for prophage induction in *Escherichia coli* K12 (Devoret's test) were applied. The results indicate that thiram is not covalently bound to DNA and does not induce prophage either in the absence or presence of metabolic activation. Thiram was found to induce gene mutations in *Aspergillus nidulans* (*methA1* suppressor induction) in the absence of metabolic activation. When thiram was used in combination with microsome fraction of rat liver, genetic inactivation of the fungicide was observed. The use of different metabolic activation systems from various mammalian and plant organisms in the study of mutagenic activity of thiram was investigated. (Author abstract by permission)

81-2920. Nehez, M.; Selypes, A.; Paldy, A.; Mazzag, E.; Berencsi, G.; Jarmay, K. (Inst. Hygiene & Epidemiol., Univ. Med., Szeged, Hungary) **Histopathological and cytogenetical picture of microtoxicological effects of 2 nitrophenol-structured pesticides in mouse experiments on germ cells.** *Mutat. Res.* 85(4): 256; 1981.

It is obvious from the author's earlier experiments that the 26% trifluralin containing Olitref and the 50% DNOC containing Krezonit E given at doses of 0.33 resp. 0.66 of the LD50 significantly raise the mutation frequency of mouse germinal chromosomes. In the present work it is investigated in male CFLP strain mice if these pesticides are still mutagenic and evoke histopathological changes when given at a dose of 0.01 of the LD50. The spermatocytes were prepared according to Evans and Schleiermacher. For the histopathological evaluations the preparations were fixed in formaldehyde, embedded in paraffin and stained with hematoxylin-eosin. Neither macroscopic nor microscopic changes of the testicular tissue were found. Evaluating the chromosomes of the spermatocytes the number of the univalents increased after Olitref treatment reaching significancy, while the effect of Krezonit E is more obvious. (Author abstract by permission)

81-2921. Braun, R.; Schoneich, J.; Brezani, P.; Weissflog, L.; Dedek, W. (Zentralinst. Genet. & Kulturpflanzenforschung AdW DDR, DDR-4325 Gatersleben, DDR) **Activity of organophosphorous insecticides in bacterial tests for mutagenicity and DNA repair: per se alkylation versus metabolic activation.** *Mutat. Res.* 85(4): 259; 1981.

Genotoxic activity of organophosphates might be, at least theoretically, a consequence of several reactions: per se alkylation of DNA by the *O*-alkyl groups, per se mutagenicity due to a genetically active side chain, side chain splitting and formation of low molecular mutagenic metabolites, and formation of reactive intermediates by enzymatic reaction with epoxide structure. We have investigated these possibilities for a number of organophoshates and -phosphonates including butonate, vinyl butonate, trichlorform, dichlorovos, naled, and some demethyl and side-chain derivatives of these compounds using the Ames test. We found no evidence for metabolite formation and reactive intermediates, while all other mutagenic pathways could be demonstrated. Its significance is different in the compounds studied and strongly dependent on the side-chain structure. For dichlorvos per se alkylation was found to be the most important reaction for genotoxic activity. The non-alkylating demethyl dichlorvos did not show mutagenic or DNA-damaging properties. Compounds with complex side-chain structure like butonate and vinyl butonate were non-mutagenic. (Author abstract by permission)

81-2922. Quinto, I.; Martire, G.; Vricella, G.; Riccardi, F.; Perfumo, A.; Giulivo, R.; De Lorenzo, F. (II Ist. Chim. Biol., II Fac. Med. Chir., Univ. Napoli, Italy) **Screening of 24 pesticides by *Salmonella*/microsome assay: mutagenicity of benazolin, metoxuron and paraoxon.** *Mutat. Res.* 85(4): 265; 1981 (1 reference).

Widely used pesticides have been shown to be mutagenic and contaminate the food chain, causing genetic risks to humans daily exposed to their intake with food. In the current study 24 commercially available pesticides were tested on the 5 tester strains of *Salmonella*/microsome assay up to toxic concentrations, with and without metabolic activation by Aroclor 1254 induced rat liver homogenate. The following pesticides were investigated: aminocarb, benazolin, benthiocarb, binapacryl, chlorfen-

son, chlorophacinone, chlorothalonil, chlorthal, crimidine, cyhexatin, demeton-S-methylsulfoxide, dialifor, dimetilan, disulfoton, endosulfan, fuberidazole, metaldehyde, methoxychlor, metoxuron, Neosar, paraoxon, phencapton, phorate and thiabendazole. Benazolin and paraoxon were direct weak mutagens on TA98 and TA1538. Metoxuron, already shown as a weak mutagen on TA1535 with metabolic activation, in the present study was a rather strong mutagen on TA100 in the presence of rat liver homogenate. These mutagenic pesticides have been largely used: benazolin and metoxuron as herbicides mainly for grass weed control in cereals; paraoxon as insecticide. Because of the present results, we believe the genotoxicity of these pesticides should be further investigated. (Author abstract by permission)

81-2923. Zimonjic, D.; Soldatovic, B.; Haidary, M. A. N.; Dujin, N. (Dep. Biol., Vet. Fac., Beograd, Yugoslavia) **Cytogenetical effects of some pesticides.** *Mutat. Res.* 85(4): 285; 1981.

The effects of different concentrations of DDT and lindane on human lymphocytes and rat fibroblasts *in vitro* were observed. The same effects were evaluated also under experimental conditions *in vivo* in rats sustained for a long time by food containing a significant amount of mentioned pesticides. The effects of pesticides were followed on the levels of mitotic activity and the appearance of numerical and structural chromosomal aberrations. It could be concluded that DDT as well as lindane cause significant changes in mitotic activity, expressed through the decrease of mitotic index. Also, some increase of the numerical and structural aberration values was observed both under *in vitro* (in man and rat) and *in vivo* (in rat) experimental conditions. (Author abstract by permission)

81-2924. Vachkova-Petrova, R. (Inst. Nutr., Sofia, Bulgaria) **Mutagenicity study of endodan in rats.** *Mutat. Res.* 85(4): 288; 1981.

Endodan, etem (ethylene thiuram monosulfide), is a new fungicide with good prospects for agriculture. The mutagenic activity of technical endodan was evaluated with the method of cytogenetic analysis of rat bone marrow after acute and short-term oral exposure. In the acute study, groups of 6 male and female animals were treated with endodan at a dose of 0.2 LD50 and then killed 6, 12, 24 and 36 hr following administration. In the short-term studies, several doses of endodan were administered to groups of 6 animals (a) twice at an interval of 24 hr, (b) 5 successive days. The animals were killed 6 h after the last administration. The cells in metaphase are analyzed for aneuploidy and aberrations. Preliminary evaluation of the results failed to reveal mutagenic effects that could be attributed to the chemical. (Author abstract by permission)

81-2925. Degraeve, N.; Chollet, M.; Moutschen, J.; Moutschen-Dahmen, M.; Gilot-Delhalle, J.; Colizzi, A. (Lab. Genet., Univ. Liege, Belgium) **Genetic and cytogenetic effects of trichlorfon in acute, subacute and chronic treatment.** *Mutat. Res.* 85(4): 297; 1981.

Genetic and cytogenetic effects of trichlorfon have been tested in mice in experimental conditions corresponding to acute poisoning (1 × 100 mg/kg ip), therapeutic treatment in *Schistosoma haematobium* infections (5 × 20 mg/kg po at 14-day intervals) and chronic poisoning by pesticide residues (0.5 ppm in drinking water during 7 wk). The cytogenetic effects induced in bone marrow and in spermatogonia were observed 12-72 hr after the acute treatment, 24-96 hr after the last injection in subacute treatment and at the end of the 7th wk in chronic treatment. The effects on diakinesis were observed 10-16 days after the acute treatment, 24-96 hr after the last injection in subacute treatment and at the end of the 7th wk in chronic treatment. In these 3 test systems the frequency of fragments, gaps and exchanges was not increased over the control level. In the dominant lethal mutation test, treated males were mated with untreated females during 7 wk after the acute treatment and during 1 wk after subacute and chronic treatments. The results obtained for the frequency of preimplantation losses, post-implantation deaths and live embryos per female were within the control limits. (Author abstract by permission)

81-2926. Ashwood-Smith, M. J. (Environ. Toxicol. Res. Group., Dep. Biol., Univ. Victoria, BC V8W 2Y2, Canada) **The genetic toxicology of aldrin and dieldrin.** *Mutat. Res.* 86(2): 137-154; 1981 (136 references).

The chemistry of dieldrin and aldrin, and their carcinogenic and mutagenic capabilities are reviewed. It is concluded that most of the short-term tests designed to give an early warning of a possible carcinogen as a mutagen would have performed very poorly in detecting the proven carcinogenic properties of dieldrin in mice. The cause of the carcinogenicity of these compounds is not known. Mutagenicity studies in bacterial systems with and without metabolic activation were essentially negative. Mammalian mutagenicity studies would have been more convincing with properly controlled positive controls and the reporting of dose-response curves. Chromosome studies have suffered from the same lack of internal and positive controls. Investigations into the effects of aldrin or dieldrin on DNA are found to be equivocal. At present only one mammalian species, the mouse, has given reasonable evidence for the carcinogenicity of dieldrin.

81-2927. Yoneyama, K.; Matsumura, F. (Pestic. Res. Cent., Michigan State Univ., East Lansing, MI 48824) **Reductive metabolism of heptachlor, parathion, 4,4′-dichlorobenzophenone, and carbophenothion by rat**

liver systems. *Pestic. Biochem. Physiol.* 15(3): 213-221; 1981 (14 references).

Adult male Sprague-Dawley rats were used for rat liver microsomal preparations. Alteration of chemicals by liver microsomes in anaerobic conditions was examined using heptachlor, parathion, 4,4′-dichlorobenzophenone (4,4′DBP) and carbophenothion sulfoxide. All the chemicals, except carbophenothion sulfoxide, were anaerobically metabolized to their expected reductive metabolites by rat liver microsomes. Heptachlor was converted to chlordene by dechlorination, parathion to aminoparathion by nitroreduction, and 4,4′-DBP to 4,4′-DBH by keto reduction. The most prominent product with carbophenothion sulfoxide was the sulfone, particularly in the presence of NADPH, indicating some residual oxidative activity even under this reductive condition. Metabolism of the pesticides by the 105,000 *g* supernatant under anaerobic conditions was studied, and the results indicate that the supernatant is distinctly different from the microsomal fraction. The supernatant had a high activity for the reduction of parathion to aminoparathion and carbophenothion sulfoxide to carbophenothion.

81-2928. Singh, N. N.; Srivastava, A. K. (Dep. Zool., Univ. Gorakhpur, Gorakhpur 273001, Uttar Pradesh, India) **Effect of a paired mixture of aldrin and formothion on carbohydrate metabolism in a fish, *Heteropneustes fossilis*.** *Pestic. Biochem. Physiol.* 15(3): 257-261; 1981 (21 references).

Female freshwater Indian catfish were collected and exposed to a 0.114-ppm aldrin-formothion mixture. Sampling for various biochemical parameters was done at 3, 6, 12, 48, and 96 hr postexposure. Blood glucose levels were significantly low at 3, 12, 48, and 96 hr after the treatment. However, at 6 hr no significant change was observed. Blood lactate levels in treated fish increased significantly at 3, 6, 12, and 96 hr from the mean control value of 13.96 mg/100 ml. After 48 hr of exposure blood lactate value was unaffected. The marked glycogenolysis in muscle at 6 and 48 hr and in liver at 3, 6, 12, and 48 hr was probably due to a stress-induced increase in circulating catecholamines. The abrupt decline in both muscle and liver glycogen at different time intervals resulted in hyperlacticemia. Hypoglycemia, which may have resulted from increased insulin secretion, was noted at 3, 12, 48 and 96 hr.

81-2929. Thakore, K. N.; Karnik, A. B.; Nigam, S. K.; Lakkad, B. C.; Bhatt, D. K.; Babu, A.; Kashyap, S. K.; Chatterjee, S. K. (Natl. Inst. Occup. Health, Meghani Nagar, Ahmedabad 380016, India) **Sequential changes in lactate, isocitrate, and malate dehydrogenases in mice exposed to technical grade hexachlorocyclohexane (BHC) and their possible relationship to liver tumors.** *Pestic. Biochem. Physiol.* 15(3): 262-266; 1981 (18 references).

Pure inbred Swiss mice 6-8 wk of age were divided into 4 groups, one of which served as control. In group A the diet was mixed with 500 ppm BHC and fed for 2, 4, 6, and 8 mo in respective subgroups. In group B the same schedule was followed; all animals were then fed a diet without BHC for 4 mo. In group C, subgroups were fed a diet containing 500 ppm BHC for 2, 4, 6 and 8 mo, followed by 4 mo on a diet without BHC. After this period, animals of group C were fed food containing BHC for 1 mo. An increase was noted in the liver wt/body wt ratio, and a decrease in protein and all 3 enzymes (lactate dehydrogenase, isocitrate dehydrogenase, and malate dehydrogenase) after BHC feeding for the different time periods. Discontinuation of BHC in the diet resulted in reversion of these parameters to normal. Refeeding of BHC caused decreased values. It is concluded that the changes in enzyme concentrations were associated with hexachlorocyclohexane feeding in the diet.

81-2930. Rao, D. M. R.; Devi, A. P.; Murty, A. S. (Dep. Zool., Nagarjuna Univ., Nagarjunanagar 522510, India) **Toxicity and metabolism of endosulfan and its effect on oxygen consumption and total nitrogen excretion of the fish *Macrognathus aculeatum*.** *Pestic. Biochem. Physiol.* 15(3): 282-287; 1981 (20 references).

Studies were conducted to determine the effects of endosulfan on freshwater fish. Toxicity, metabolism and oxygen consumption were monitored in *Macrognathus aculeatum* exposed to the pesticide. The 96-yr LC50 was 3.5 ppb. The compound was metabolized to non-toxic endosulfan ether by the kidney and liver. The intermediate, endosulfan sulfate, was found in brain, gills, gut, liver and kidney. Oxygen consumption and total nitrogen excretion were decreased by all levels of the pesticide, indicating that the pesticide probably acts as a respiratory poison and reduces protein metabolism.

81-2931. Baker, M. T.; Carlson, G. L.; Van Dyke, R. A. (Mayo Clin., Rochester, MN 55901) **Metabolism-dependent covalent binding of DDT and lindane to cellular macromolecules.** *Pharmacologist* 23(3): 173; 1981.

The nature of the *in vitro* metabolism and binding of ^{14}C-DDT and ^{14}C-lindane to microsomal protein and lipids, and to exogenous DNA, were studied in hepatic microsomes from phenobarbitol-pretreated rats. In incubations containing NADPH, DDT and lindane bound to microsomal proteins and lipids, but not to DNA. DDT binding was enhanced by low O_2 concentrations. Lindane binding was inhibited by low O_2. The addition of trichloropropane oxide enhanced lindane binding, but inhibited DDT binding. It is suggested that an oxidative pathway may be involved in these processes.

81-2932. Giri, S. N.; Parker, H.; Spangler, W.; Misra, H.; Ishzaki, G.; Schiedt, M.; Chandler, D. (Sch. Vet. Med., Univ. California, Davis, CA 95616) **Pharmacokinetics of (^{14}C)-paraquat and associated biochemical and pathologic changes in beagles following iv administration.** *Pharmacologist* 23(3): 173; 1981.

Beagles were given iv doses of (^{14}C)-paraquat, and pharmacokinetic changes were observed. Paraquat caused an increase in the activities of plasma LDH and CPK and in the GOT activity. A biphasic decline was seen in the plasma creatinine and renin levels, as well as in the hematocrit and plasma protein. A decrease was seen in plasma K^+, Na^+, and Cl^-. At necropsy, the kidneys of treated animals showed tubular necrosis; hepatic changes included cell vacuolation; lungs showed patchy edema.

81-2933. Hewitt, L. A.; Hewitt, W. R.; Plaa, G. L. (Dep. Pharmacol., Univ. Montreal, Montreal, Quebec, Canada) **Fractional hepatic distribution of $^{14}CHCl_3$ in mice and rats treated with Kepone or mirex.** *Pharmacologist* 23(3): 174; 1981.

In studies designed to determine whether Kepone (chlordecone) or mirex pretreatments alter the fractional hepatic distribution of $^{14}CHCl_3$, mice and rats were given an oral dose of corn oil (control), 50 mg Kepone/kg, or 50 mg mirex/kg, followed 18 hr later by an oral dose of $^{14}CHCl_3$. Analysis of the liver in both species showed that Kepone, but not mirex, increased total hepatic content of ^{14}C, total bound ^{14}C, and %^{14}C bound to liver constituents. In the rat, treatment with Kepone, but not mirex, caused a significant shift in the distribution of lipid, protein, and acid-soluble bound ^{14}C. These results suggest processes by which Kepone may enhance haloalkane hepatotoxicity.

81-2934. Joy, R. M.; Giri, S. N.; Schiedt, M. J. (Dep. Physiol., Sch. Vet. Med., Univ. California, Davis, CA 95616) **Brain cyclic nucleotide levels are elevated by nonconvulsive exposures to dieldrin.** *Pharmacologist* 23(3): 174; 1981.

Male mice were treated with nonconvulsive and convulsive doses of dieldrin (5-15 mg/kg, ip) in a study of brain cyclic nucleotide levels. Following dieldrin treatment, cAMP and cGMP increased in both a dose- and time-related manner. At 1 hr, cAMP activity was 144 ± 4.6% and cGMP activity was 289 ± 64.3% of control levels.

81-2935. Cushman, J. R.; Street, J. C. (Toxicol. Program, Utah State Univ., Logan, UT 84322) **Allergic hypersensitivity to the herbicide 2,4-D in mice.** *Pharmacologist* 23(3): 174; 1981.

Since the herbicide 2,4-D has been reported to cause allergic responses, studies were carried out to determine whether 2,4-D causes cell-mediated or antibody-mediated hypersensitivity in female BALB/c mice. When mice previously treated on the abdomen with 2,4-D were challenged in the ear, no effects were seen, based on changes in ear thickness and 5-(^{125}I)iodo-2′-deoxyuridine incorporation in the ear. When mice were administered 2,4-D protein conjugate, specific IgE production was elicited following the secondary sensitization. This response may be responsible for the alleged hypersensitivity in some exposed humans.

81-2936. Doherty, P. A.; Ferm, V. H.; Smith, R. P. (Dep. Pharmacol. & Anat., Dartmouth Med. Sch., Hanover, NH 03755) **Cyanide teratogenicity in the Syrian golden hamster (SGH).** *Pharmacologist* 23(3): 214; 1981.

Pregnant Syrian golden hamsters were given continuous infusions of NaCN via osmotic minipumps to determine possible teratogenic effects of cyanide. This study was conducted to elucidate the teratogenic effects of acrylonitrile and propionitrile, thought to be due to continuous metabolic release of cyanide. The NaCN infusion occurred on days 6-9 of gestation at rates ranging from 0.12 to 0.13 mmol/kg/hr. Fetuses were examined on day 11 of gestation. Litters of dams treated with 0.124 mmol/kg/hr or less showed few malformations. However, of the 7 dams given 0.128 mmol/kg/hr, 5 of the litters had 3 or more malformed fetuses and 2 litters were completely resorbed. The malformations noted were exencephaly or encephalocoeles, hydropericardium, and limb and tail defects.

81-2937. Sultatos, L. G.; Costa, L. G.; Murphy, S. D. (Div. Toxic., Med. Sch., Univ. Texas, Houston, TX 77025) **The role of glutathione in the detoxification of chlorpyrifos and methyl chlorpyrifos in mice.** *Pharmacologist* 23(3): 214; 1981.

Studies on the extent of glutathione (GHS)-mediated detoxification of chlorpyrifos (CPS), methyl chlorpyrifos (MCPS), and their oxygen analogues were designed in an effort to explain the 14-fold differences in toxicity of CPS and MCP. When GSH-fortified mouse liver cytosol was incubated with 1000 mmol of insecticide, 458 and 819 mmol of CPS and MCPS, respectively, disappeared. When mice were treated with 1000 mg MCPS/kg, a marked, prolonged depletion of hepatic GSH occurred. HPLC analyses indicated that brain levels of MCPS at least 10 times greater than those of CPS were required to achieve the same degree of brain cholinesterase inhibition. Apparently, only a portion of the differences in acute toxicity between CPS and MCPS is due to GSH-mediated detoxification.

81-2938. Chang, F.; Hegeman, S.; Bosin, T. (Pharmacol. Sec., Med. Sci. Program, Indiana Univ., Bloom-

ington, IN 47405) **Uptake of diquat and paraquat by rat lens *in vitro*. *Pharmacologist* 23(3): 214; 1981.**

Uptake of ^{14}-labeled diquat or paraquat was studied in isolated rat lenses incubated for 12, 24, or 48 hr at 37 or 4°C in medium containing 100 μM labeled diquat or paraquat. No differences in uptake of the 2 compounds were found. Incubation with metabolic inhibitors suppressed the uptake of diquat, but not of paraquat. Uptake of both compounds was suppressed by incubation at 4°C. The differential toxicity found *in vivo* may be explained by the possibility that diquat uptake involves an active process, while paraquat uptake does not.

81-2939. Wagstaff, D. J.; McDowell, J. R.; Paulin, H. J. (Epidemiol. Unit, Bur. Foods, Washington, DC 20204) **Egg binding in broiler chickens fed heptachlor.** *Poult. Sci.* 60(7): 1578-1580; 1981 (7 references).

Egg binding was observed at 25 to 29 wk of age in broiler chickens fed 0.1 or 0.3 ppm of heptachlor in the ration during the first 8 wk of life. Eggshell thickness was not affected, but heavier and misshapen eggs were laid by chickens fed heptachlor. (Author abstract by permission)

81-2940. Suwathep, M.; Parkhurst, C. R.; McCorkel, F. M. (Monstanto, St. Louis,- MO 63166) **Efficacy of sorbic acid as a fungistatic compound in low and high moisture broiler diets.** *Poult. Sci.* 60(7): 1741-1742; 1981.

Rising fuel costs for drying feed grains such as corn have brought renewed interest in storing high moisture corn. Feeding high moisture grains such as corn as part of a broiler diet has shown these diets to be slightly inferior to dry feed diets. Additionally it is generally accepted that aflatoxin can be produced by *Aspergillus flavus* and *Aspergillus parasiticus* which may grow on grain in storage when the moisture is elevated and the temperature is favorable. Varying results have been reported using mold inhibitors made of various organic acids in broiler trials. These results have ranged from slightly negative to positive in battery trials. In this study 2160 straight-run day-old Vantress × Arbor Acres broiler chicks were divided into 36 pens on new litter at a density of 0.06 m²/bird and reared to 51 days of age. Moisture levels of 11-11.5% and 14.15% were selected as low and high moisture diets. Sorbic acid was added as a mold inhibitor at the level of 0.025% in both diets in the starters, and then in both diets in the starter and grower. Controls were maintained for both diets. There was no significant difference in body wt among treatments in this trial. Mortality was decreased ($P < 0.05$) in the sorbic acid treatments. Feed conversion was statistically improved ($P < 0.05$) when sorbic acid was added in the high moisture starter and both diets with sorbic acid in the starter and grower. (Author abstract by permission)

81-2941. Mason, R. R.; Schulte, G. J. (Dep. Biol., Northeast Missouri State Univ., Kirksville, MD 63501) **Interaction of *o,p'*-DDT with the estrogen-binding protein (EBP) of DMBA-induced rat mammary tumors.** *Res. Commun. Chem. Pathol. Pharmacol.* 33(1): 119-128; 1981 (32 references).

The ability of *o,p'*-DDT to interact with cytoplasmic EBP of a hormone-dependent carcinoma was investigated to provide information that will aid future experiments involving the actions of *o,p'*-DDT on mammary tumors. Female 50-day-old Holtzman strain rats were given 20 mg DMBA by gavage. Tumors appeared within 6-8 wk. Tumor cytosol was prepared. In vitro studies with Scatchard plot analysis indicated that *o,p*-DDT completely inhibited 3H-labeled estradiol binding; sucrose density gradient analysis demonstrated that *o,p'*-DDT displaced estradiol from specific 4S and 8S proteins. As estrogens have been shown to affect the development and growth of these tumors, the findings of this study suggest that *o,p'*-DDT may influence DMBA-induced tumors in an estrogenic manner.

81-2942. Kurppa, K. (Inst. Occup. Health, SF-00290 Helsinki 29, Finland) **Marked lethality of rats in combined exposure to carbon monoxide and diethyldithiocarbamate.** *Res. Commun. Chem. Pathol. Pharmacol.* 33(1): 179-182; 1981 (9 references).

Male Wistar rats were injected ip with 0.5 g DDC/kg body wt in saline; 23 DDC-injected rats and 26 control rats were exposed to 1000 ppm carbon monoxide (CO) for 2.5 hr, 16 DDC-injected rats were exposed to ambient air only. None of the rats exposed to CO alone died during exposure nor during the ensuing 24-hr period. No immediate deaths or later deaths were found in the group exposed to DDC and ambient air. However, 70% of rats treated with DDC and immediately exposed to CO died. Rats exposed to CO alone reached an equilibrium concentration of COHb of ~ 60%, while 2 of the DDC-injected rats that died after CO exposure reached COHb concentrations of only 48 and 58%. It was concluded that DDC did not seem to increase the affinity of hemoglobin for CO. The mechanism of the lethality of the combined exposure is unknown.

81-2943. Seinen, W.; Helder, T.; Vernij, H.; Penninks, A.; Leeuwangh, P. (Pathol. & Toxicol. Pharmacol. Dep., Fac. Vet. Sci., State Univ. Utrecht, Utrecht, The Netherlands) **Short term toxicity of tri-*N*-butyltinchloride in rainbow trout (*Salmo gairdneri* Richardson) yolk sac fry.** *Sci. Total Environ.* 19(2): 155-166; 1981 (26 references).

Rainbow trout in the yolk sac fry stage were chronically exposed to 0, 0.2, 1 or 5 ppb of tri-*n*-butyltinchloride (TBTC) for 110 days. After 10-12 days, all fish in the 5 ppb group died with hydropic degeneration of tubule

segments of the pronephros. TBTC produced a significant dose-dependent growth retardation at the other exposure levels along with a decrease in the hemoglobin content of the blood. Reduced red blood cell numbers in TBTC-exposed fry caused hyperplasia of liver cells and decreased liver wt. These findings show that the same levels of TBTC required to kill snails may be harmful to young trout.

81-2944. Walker, J. R. L.; Lien, B. C. (Bot. Dep., Univ. Canterbury, Christchurch, New Zealand) **Metabolism of fluoroacetate by a soil *Pseudomonas* sp. and *Fusarium solani*.** *Soil Biol. Biochem.* 13(3): 231-235; 1981 (14 references).

Enzymes capable of cleaving the C-F bond of fluoroacetate and other organofluorines were purified from soil pseudomonads and the soil fungus *Fusarium solani*. The 2 isolated haloacetate halidohydrolases readily released fluoride ions from monofluoroacetate and the rodenticide fluoroacetamide. The enzymes also cleaved C-Cl and C-Br bonds in monochloroacetate and monobromoacetate. The enzymes were inhibited by fluoride ion. Although the enzymes were similar from both organisms, the bacterial enzymes were more stable at 55°C, with different overall temperature coefficients for its higher and lower ranges.

81-2945. Chao, W. L.; Alexander, M. (Dep. Agron., Cornell Univ., Ithaca, NY 13853) **Interaction between protozoa and *Rhizobium* in chemically amended soil.** *Soil Sci. Soc. Am. J.* 45(1): 48-50; 1981 (20 references).

The population of a strain of *Rhizobium phaseoli* resistant to streptomycin, erythromycin, cycloheximide, and thiram fell markedely after its addition to soil, and the numbers of indigenous protozoa rose. In sterile soil inoculated with a protozoa-free mixture of soil microorganisms, the decline in *R. phaseoli* was not as marked and was not affected by the presence of thiram. When added to nonsterile soil amended with thiram or cycloheximide, the *R. phaseoli* strain survived in larger numbers than in soil not receiving the chemicals, and the abundance of protozoa rose after an initial decline. Only one morphological type of protozoa was found in the cycloheximide-treated soil. It is suggested that the number of protozoa as well as which protozoa are active determine the population of surviving rhizobia. (Author abstract by permission)

81-2946. Kluwe, W. M. (Natl. Inst. Environ. Health Sci., Res. Triangle Park, NC 27709) **Acute toxicity of 1,2-dibromo-3-chloropropane in the F344 male rat. I. Dose-response relationships and differences in routes of exposure.** *Toxicol. Appl. Pharmacol.* 59(1): 71-83; 1981 (31 references).

Single treatments of F344 male rats with the nematocide 1,2-dibromo-3- chloropropane (DBCP) produced acute injury to the kidney, epididymis, testis, and liver. Severity was proportional to the size of the dose administered, but the kidney was adversely affected at a lower single dose (40 mg/kg) than was the testis or liver (80 mg/kg). Primary target cells in the kidney were proximal tubular epithelia in the outer medulla. Disturbances in renal function included impaired tubular reabsorption (glucose, fluid, and electrolyte transport) and reduced glomerular filtration. Mild, hepatocellular swelling was produced by 40 mg/kg DBCP, while the leakage of intracellular enzymes into the blood, and centrolobular hepatocellular necrosis occurred after 80 and 120 mg/kg, respectively. The acute testicular lesion was characterized by degeneration and desquamation of the caput epididymal (head of the epididymis) epithelium and by disruption of the seminiferous tubular architecture; these effects were more severe after 120 mg/kg than after 80 mg/kg. Comparisons of the acute toxicity of DBCP following repeated sc, po (by gavage), and ip administration (40 mg/kg daily for 4 days) failed to reveal qualitative differences attributable to the route of exposure. However, the severity of the renal lesion appeared comparatively greatest when treatment occurred sc. These results indicate that DBCP is a cytotoxicant for epididymal and renal proximal tubular epithelia and, since lesions were produced by repeated exposure to acutely subtoxic doses, suggest that its effects on these tissues may be cumulative. (Author abstract by permission)

81-2947. Kluwe, W. M. (Natl. Inst. Environ. Health Sci., Res. Triangle Park, NC 27709) **Acute toxicity of 1,2-dibromo-3-chloropropane in the F344 male rat. II. Development and repair of the renal, epididymal, testicular, and hepatic lesions.** *Toxicol. Appl. Pharmacol.* 59(1): 84-95; 1981 (24 references).

A single sc injection of 100 mg/kg 1,2-dibromo-3-chloropropane (DBCP) to adult, male F344 rats caused severe damage to the kidney, epididymis, and testis, and injury of lesser severity to the liver. The renal injury consisted of proximal tubular necrosis, severe impairment of tubular function, and increased urinary excretion of protein and several enzymes. Although function returned to normal within 5-10 days after DBCP treatment, large areas of the kidney were fibrotic and contained foci of interstitial nephritis 30 days postexposure. The testicular lesion consisted of progressive seminiferous tubular desquamation and atrophy, while epithelial cells in the caput epididymis became necrotic shortly after treatment and appeared to slough into the tubular lumen. Although a large animal to animal variation was observed, numerous seminiferous tubules were still devoid of germinal cells 30 days after DBCP treatment and epididymal sperm density remained low. DBCP caused transient increases in liver wt and the activities in serum of several enzymes associated with chemically induced hepatotoxicity and produced mild

periportal hepatocellular swelling. The liver effect were relatively mild and completely reversed within 48-72 hr. These results confirm that DBCP is a nephrotoxicant and gonadotoxicant in rats and indicate that acute intoxication may cause irreversible effects. Moreover, the testicular lesion produced by a single exposure to DBCP resembles that found in humans repeatedly exposed to DBCP. The male F344 rat, therefore, appears to be an appropriate model for studying the mechanisms of infertility and other toxic effects of DBCP. (Author abstract by permission)

81-2948. Holsapple, M. P.; Yim, G. K. W.* (Dep. Pharmacol. & Toxicol., Sch. Pharm. Sci., Purdue Univ., West Lafayette, IN 47907) **Decreased gastrointestinal ulcerogenicity of chlordimeform, a basic anti-inflammatory agent.** *Toxicol. Appl. Pharmacol.* 59(1): 107-110; 1981 (13 references).

The present study compares the gastrointestinal toxicity of aspirin and chlordimeform (CDM), a formamidine pesticide that also has anti-inflammatory actions. Carrageenin-induced paw edema was reduced by 80% following CDM (0.6 mmol/kg, po) as compared to the 38% reduction following an equimolar po dose of aspirin. At effective anti-inflammatory doses, ip aspirin induced moderate, and po aspirin induced severe gastric ulcers in the rat. In contrast, ip CDM induced mild gastric ulcers, while po CDM did not cause gastric ulceration. Neither po aspirin nor po CDM induced intestinal ulceration. Thus, CDM shares with other basic inhibitors of prostaglandin synthesis low gastrointestinal toxicity, but is unique in producing potent anti-inflammatory activity. (Author abstract by permission)

81-2949. Ross, J. H.; Krieger, R. I.* (Vet. Med., Univ. Idaho, Moscow, ID 83843) **Structure-activity correlations of amines inhibiting active uptake of paraquat (methyl viologen) into rat lung slices.** *Toxicol. Appl. Pharmacol.* 59(2): 238-249; 1981 (40 references).

Analysis of amine structure with respect to inhibitory potency utilized a new method for determining equipotent inhibitor concentrations of paraquat uptake by lung slices. Fifteen *N*-alkyl homologues of paraquat (viologens) were tested and inhibition of lung uptake of paraquat was found to be a function of the inductive effect and steric bulk of groups attached to the nitrogens of 4,4′-bipyridyl. Several classes of amine inhibitors were examined. Polyamines were generally more potent than compounds containing only 1 quaternizable nitrogen at pH 7.4. α,ω-Diaminoalkanes were the most potent inhibitors of paraquat accumulation by lung slices. (Author abstract by permission)

81-2950. Seth, P. K.; Agrawal, A. K.; Bondy, S. C. (Lab. Behav. & Neurol. Toxicol., Natl. Inst. Environ. Health Sci., Res. Triangle Park, NC 27709) **Biochemical changes in the brain consequent to dietary exposure of developing and mature rats to chlordecone (Kepone).** *Toxicol. Appl. Pharmacol.* 59(2): 262-267; 1981 (25 references).

Adult male rats receiving 10 or 30 ppm chlordecone (Kepone) in the diet for 90 days exhibited decreased binding of [^{3}H]spiroperidol in membranes prepared from the striatum. [^{3}H]Muscimol and [^{3}H]quinuclidinyl benzilate binding in the cerebellum were also depressed. The binding of [^{3}H]diazepam and [^{3}H]serotonin to cortical membranes was unaltered in treated animals. The areas of brain of exposed animals which exhibited a reduced ability to bind several ligands for specific neurotransmitter-receptor sites also possessed an increased amount of membrane protein. The frontal cortex of chlordecone-dosed rats where ligand binding was not altered, showed no significant change in membrane protein content. Thus chlordecone-induced alterations in receptor properties could be accounted for in terms of a region-specific hyperplastic increase in nonreceptor proteins. Thirty days after cessation of dosing ligand-binding properties and membrane protein from regions of treated animals did not differ significantly from controls, suggesting that these effects were reversible at the dose levels used. Male and female rats exposed indirectly throughout gestation and lactation showed no abnormal concentrations of membrane protein at 30 days of age after a maternal diet of 1 or 6 ppm chlordecone. No decrease in cerebellar binding of muscimol or quinuclindinyl benzilate, in frontal cortical binding of serotonin, or in striatal binding of spiroperidol was observed. At the 6-ppm dose level, male rats had an elevation of striatal dopamine binding. These data illustrate that gestational exposure to chlordecone can have effects that are in an opposite direction than those observed after exposure of adults to a higher dose level. (Author abstract by permission)

81-2951. Chu, I.; Villeneuve, D. C.; Valli, V. E.; Secours, V. E.; Becking, G. C. (Room 328, Environ. Health Cent., Ottawa, Ontario K1A OL2, Canada) **Chronic toxicity of photomirex in the rat.** *Toxicol. Appl. Pharmacol.* 59(2): 268-278; 1981 (20 references).

Photomirex (8-monohydromirex) was fed to rats for 21 mo at dietary levels of 0, 0.2, 1.0, 5.0, 25, and 125 ppm. All 10 rats fed the 125-ppm diet died during the experiment and decreased body wt was noted preceding death. Body wt gain and food consumption were not affected by photomirex at levels up to and including 25 ppm. Increased liver wt occurred in groups dosed at 5.0 ppm photomirex and higher. Photomirex caused significant increases in the activities of serum lactic dehydrogenase, glutamine oxalacetic transaminase and sorbitol dehydrogenase, and hepatic microsomal aniline hydroxylase and aminopyrine *N*-demethylase. Hematological parameters were not altered by treatment. Treatment-related histological lesions were found in the livers and thyroid of rats fed the lowest dose of photomirex. A

number of tumors occurred in the tissues of treated as well as control animals, but the thyroid tumors appeared to have increased frequencies in the treated groups. The results of the present study confirm our previous findings and show that photomirex is a potent hepato- and thyrotoxin. (Author abstract by permission)

81-2952. Abd-Elraof, T. K.; Dauterman, W. C.; Mailman, R. B. (Toxicol. Prog./Dep. Entomol., North Carolina State Univ., Raleigh, NC 27650) ***In vivo* metabolism and excretion of propoxur and malathion in the rat: effect of lead treatment.** *Toxicol. Appl. Pharmacol.* 59(2): 324-330; 1981 (21 references).

Lead was administered to Long-Evans rats by daily oral gavage for 30 days at doses of 200, 400 or 600 mg lead/kg/day. The rats were then administered 1 of the radiolabeled insecticides and the metabolic products examined. The lead-treated rats had blood lead concentrations of ~ 200 μg/dl in the 200 mg/kg/day group and ~ 475 in the 400 mg/kg/day group. Concentrations of lead in the femur were 500 μg/g or higher. Despite this high body burden of lead (accompanied by a 30% wt deficit at 600 mg/kg/day), no difference in the rate of elimination of radiolabeled material was observed. Furthermore, the lead treatments did not change the relative proportions of the detected metabolites. Thus, despite the known effects of lead on heme synthesis, these treatments had no detectable effect *in vivo* on the metabolism of propoxur or malathion. (Author abstract by permission)

81-2953. Vodicnik, M. J.; Elcombe, C. R.; Lech, J. J. (Dep. Pharmacol. & Toxicol., Med. Coll. Wisconsin, Milwaukee, WI 53226) **The effect of various types of inducing agents on hepatic microsomal monooxygenase activity in rainbow trout.** *Toxicol. Appl. Pharmacol.* 59(2): 364-374; 1981 (52 references).

The effects of various types of inducing agents on the hepatic microsomal monooxygenase (MO) system of rainbow trout were examined and compared to the induction profiles observed following pretreatment with either 3-methyl-cholanthrene- or phenobarbital-type inducers. 2,3,7,8-Tetrachlorodibenzo-*p*-dioxin (TCDD) elevated ethoxycoumarin- and ethoxycoumarin- and ethoxyresorufin-*O*-deethylase activities (ECOD, EROD) as well as the cytochrome(s) P-450 content, but had no effect on benzphetamine- *N*-demethylation (BeND). Sodium dodecyl sulfate-polyacrylamide gel electrophoresis (SDS-PAGE) of solubilized microsomes from TCDD-pretreated fish demonstrated the intensification of a protein band with a molecular wt of 57,000. Although the magnitude of induction was not as great, isosafrole pretreatment of rainbow trout resulted in an induction profile similar to that observed following TCDD administration to these animals. Neither Kepone (chlordecone) nor mirex had a stimulatory effect on any of the measured parameters and neither caused a change in the protein profile following SDS-PAGE of solubilized microsomes. These results suggest that fish respond differently from mammals to these inducers of the hepatic microsomal MO system. (Author abstract by permission)

81-2954. Shah, P. V.; Monroe, R. J.; Guthrie, F. E. (Toxicol. Prog., Dep. Entomol., North Carolina State Univ., Raleigh, NC 27650) **Comparative rates of dermal penetration of insecticides in mice.** *Toxicol. Appl. Pharmacol.* 59(3): 414-423; 1981 (39 references).

Dermal penetration of 14 radiolabeled insecticides into ICR mice was studied. Permethrin penetrated most rapidly ($T_{0.5}$ = 5.9) while malathion penetrated least rapidly ($T_{0.5}$ = 130 min). Within 5 min after application some toxicants were in the blood, and measurable quantities of radioactivity from the majority of toxicants tested were detected in blood, liver, and other organs 15 min after application. Within 8 hr, 4-chlorobiphenyl showed almost complete penetration as did several other compounds. Insecticides showing poor dermal penetration were absorbed to the extent of 60% or greater by 8 hr. The liver, intestine, stomach, urine, and feces contained appreciable quantities of several insecticides at intervals greater than 1 hr, but only small amounts were found in other tissues. Insecticides that were slowly excreted or metabolized tended to accumulate in the carcass suggesting a major storage role in those tissues at early time intervals. Correlations with a number of physical parameters and penetration were inconclusive. (Author abstract by permission)

81-2955. Manring, J. A.; Moreland, D. E.* (Dep. Crop Sci., North Carolina State Univ. Raleigh, NC 27650) **Effects of chlordecone on isolated rat liver mitochondria.** *Toxicol. Appl. Pharmacol.* 59(3): 483-488; 1981 (19 references).

Effects of chlordecone on the membrane integrity and respiratory behavior of isolated rat liver mitochondria (RLM) were studied. Treatment of RLM with chlordecone over a concentration range of 20 to 100 μ*M* produced membrane disruption as evidenced by rapid, nonenergy-dependent swelling, permeability of the inner mitochondrial membrane to exogenously supplied NADH, and loss of protein. Over the range of concentrations tested, chlordecone stimulated state 4 respiration, inhibited state 3 respiration, and circumvented oligomycin-inhibited state 3 respiration during the oxidation of glutamate and succinate. (Author abstract by permission)

81-2956. Lock, E. A.; Berry, P. N. (Imp. Chem. Ind. Ltd., Biochem. Mech. Sect., Alderly Park, Nr. Macclesfield, Cheshire SK10 4TJ, England) **Biochemical changes in the rat cerebellum following cypermethrin**

administration. *Toxicol. Appl. Pharmacol.* 59(3): 508-514; 1981 (27 references).

Cypermethrin is a neurotoxic pyrethroid insecticide, which following iv administration to rats at 25 mg/kg, produces a reproducible sequence of signs of toxicity. These include progressively: chewing, salivation (mean time, 11 min), clonic convulsion (mean time, 27 min), and sinuous writhing movements (mean time, 42 min). Animals were killed at these defined stages of toxicity and the concentration of cerebellar amino acids and cyclic nucleotides determined. Cypermethrin increased cerebellar cyclic (t)GMP at the earliest time measured (salivation), without changing AMP. Pretreatment of animals with atropine blocked the salivation, but did not appear to alter the increase in cerebellar cGMP. Blood glucose and lactate were elevated at all times examined, while plasma ammonia was elevated at onset of the first convulsion. A corresponding increase was seen in glucose, lactate, and ammonia in the cerebellum. No significant changes were observed in the concentration of cerebellar glutamate, glutamine, γ-aminobutyrate, creatine phosphate or ATP. No increase in cAMP was seen when slices of cerebellum were incubated with cypermethrin *in vitro*. The earliest biochemical change observed following cypermethrin administration was an increase in cerebellar cGMP, which did not appear to be related to either the convulsive state of the animal or to muscarinic cholinergic stimulation. Studies *in vitro* with slices of cerebellum suggest that the stimulus for elevating cGMP may occur outside the cerebellum. (Author abstract by permission)

81-2957. Willhite, C. C.; Smith, R. P. (Dep. Pharm. & Toxicol., Dartmouth Med. Sch., Hanover, NH 03755) **The role of cyanide liberation in the acute toxicity of aliphatic nitriles.** *Toxicol. Appl. Pharmacol.* 59(3): 589-602; 1981 (31 references).

The acute ip LD50 values for a series of 6 aliphatic nitriles, including acrylonitrile, were determined in mice and compared with acetone cyanohydrin and sodium cyanide. Only sodium cyanide and acetone cyanohydrin predictably produced death within 5 min. All other nitriles produced death at intervals from a few min to many hr. Only acetone cyanohydrin and cyanide inhibited the activity of purified preparations of cytochrome c oxidase *in vitro* and in equimolar concentrations. Pretreatment of mice with carbon tetrachloride protected them against death from all nitriles except acetone cyanohydrin. Elevated concentrations of cyanide were found in the livers and brains of mice given lethal doses of all of the nitriles, acetone cyanohydrin, or sodium cyanide. The tissue concentrations of cyanide were substantially reduced in all cases when thiosulfate was also given or when nitriles were given to carbon tetrachloride-pretreated mice. Cyanide was liberated when *n*-butyronitrile or succinonitrile were incubated with mouse liver slices or NADPH-fortified mouse hepatic microsomal preparations. This reaction was inhibited when the livers were taken from mice pretreated with carbon tetrachloride or when SKF-525A was added *in vitro* to normal liver slices. Acetone cyanohydrin in all systems tested behaved qualitatively and quantitatively like its molar equivalent in cyanide. Results suggest that the nitriles examined here possess little, if any, acute toxicity in the absence of normal hepatic function and that these nitriles were activated by hepatic mechanisms to release cyanide which can account for their major acute toxic effects. (Author abstract by permission)

81-2958. Lesca, P. (Lab. Pharmacol. & Toxicol. Fond. 31078 Toulouse Cedex, France) **Metabolic activation and toxicology – some models of chemical protection against drug toxicity.** *Toxicol. Eur. Res.* 3(3): 161-166; 1981 (26 references).

The synthesis of reactive metabolites and their steady-state levels within cells and body fluids are dependent on a group of enzymes playing either an activation role or a detoxication role. The balance between the activities of these various enzymes determines the nature and the amount of reactive metabolites and thus the toxicity of the exogenous compounds. Examples of drug reductions mediated by cytochrome P-450 and leading to the production of reactive and toxic metabolites are evidenced by the polyhalogenated compounds such as DDT. The formation of cytochrome P-450 carbene complexes has been demonstrated after the reduction of DDT. Carbenes may be very reactive species towards a variety of nucleophilic groups, which may explain the hepatic toxicity of various polyhalogenated compounds.

81-2959. Bogden, J. D.; Kemp, F. W.; Troiano, R. A.; Jortner, B. S.; Timpone, C.; Giuliani, D. (Dep. Prev. Med. Community Health Neurosci. Pathol. Med., New Jersey Med. Sch., Newark, NJ) **Elevated renal copper from mercury exposure.** In: *Trace Substances in Environmental Health.* Hemphill, D. D., ed. (Univ. Missouri: Columbia): 13: 353-359; 1979 (23 references).

Forty-three weanling male Sprague Dawley rats were fed standard laboratory diets containing 1.20% Ca, 20 ppm Cu, 340 ppm Fe, 0.22% Mg, 210 ppm Mn, and 60 ppm Zn. After 2 wk of adjustment, the animals were given either mercuric chloride (20 ppm), methylmercury chloride (20 ppm for 14 days and 10 ppm for 30 days), or sodium chloride *ad libitum* via drinking water for 44 days. Kidney wt was significantly higher in animals receiving either mercury compound. Zinc concentrations in the kidney were increased with mercuric chloride. Copper concentrations in the kidney were increased with either mercury compound. Particularly striking was a 5-fold increase in copper in the kidneys of animals receiving mercuric chloride. It is suggested that the classical nephrotoxic effects of mercury may be due in part to the associated elevated copper levels demonstrated in this study. The markedly increased kidney copper in mercury-dosed animals may be a general

metabolic response to heavy metals, which are renal toxins. Renal lesions were not found in the mercury-dosed rats.

81-2960. Buckler, D. R.; Witt, A., Jr.; Mayer, F. L.; Huckins, J. N. (Columbia Natl. Fish. Res. Lab., US Fish & Wildl. Serv., Columbia MO 65201) **Acute and chronic effects of Kepone and mirex on the fathead minnow.** *Trans. Am. Fish. Soc.* 110(2): 270-280; 1981 (30 references).

Results of laboratory toxicological studies on the organochlorine insecticides Kepone (chlordecone) and mirex in fathead minnows are reported. In acute toxicity tests, the 96-hr LC50 for Kepone in adults under flow-through conditions was 34 μg/l. The flow-through 96-hr EC50 (median effective concentration) for fry was 18 μg/l. The effect observed was extensive hemorrhage associated with apparent fracture or dislocation of the vertebral column. Mirex was not acutely toxic to fathead minnows. In chronic (full-life-cycle) studies it was determined that the maximum acceptable Kepone concentration for fathead minnows was between 1.2 and 3.1 μg/l. Reproduction may be adversely affected by concentrations as low as 0.31 μg/l. The chronic effects of mirex were limited to a possible impairment of reproductive success at 34 μg/l, which is near the compound's maximum water solubility. Chromatographic analysis of whole-fish samples showed that Kepone and mirex accumulate in fathead minnows. Accumulation factors were 1100-2200 for Kepone and 12,000-28,000 for mirex. Kepone tissue levels were below detection limits after 7 days of elimination; 46% of the mirex residues remained after 56 days in mirex-free water. Despite their structural similarity these 2 compounds exhibit very different behavior in fathead minnows.

81-2961. Grabowski, C. T. (Dep. Biol., Miami Univ., Coral Gables, FL) **Pesticide effects on prenatal cardiovascular physiology. I. An electrocardiographic study of mirex-exposed rat fetuses and newborns. II. An analysis of the causes of perinatal deaths induced by prenatal exposure to mirex.** *US NTIS PB Rep.* PB81-104,739: 46 pp.; 1980 (5 references).

Sperm-positive rats were intubated with mirex in oil (5-10 mg/kg) on days 8-1/2 to 15-1/2. Controls were untreated or oil-fed. Testing was done on day 18-1/2. Fetuses were sequentially exposed and ECGs obtained with the fetus attached to the placenta and uterus. Counterparts of standard leads, I, II and III were used. Fetuses were weighed and examined afterwards. Swollen fetuses were rated on a scale of 1 (slight edema under chin) and 5 (3 mm edema across back). ECGs from 81 controls and 205 mirex fetuses were obtained. They were evaluated for rate of heart beat, regularity of beat, PR intervals and other features. One control exhibited an abnormality, a transitory period of premature atrial contractions. Mirex-fed fetuses exhibited tachycardia, closely correlated with degree of edema. The heart rate increased from 150/min in controls to 180 in slightly swollen to 224 in swollen fetuses. Mean PR intervals increased with degree of swelling and with dose. The frequency of first degree heart block was also dose-related, ranging from 20% to 77%. Second degree heart blocks were found in 8%, 3% showed arrhythmias, and one had atrial flutter/fibrillation. These cardiovascular problems seem primarily related to mirex-induced edema and demonstrate that fetal edema is not innocuous. These data demonstrate the usefulness of fetal electrocardiography to detect functional teratology. (Author abstract by permission)

81-2962. Eversole, A. G. (Water Resour. Res. Inst., Clemson Univ., Clemson, SC) **Effects of water-borne mirex on the survival and production of *Macrobrachium rosenbergii* (De Man).** *US NTIS PB Rep.* PB81-124,091: 54 pp.; 1980 (29 references).

Water-borne mirex, in concentrations above 100 μg/l, was lethal to postlarval *Macrobrachium rosenbergii* in a 24-hr exposure acute toxicity experiment. Adult and juvenile prawns did not show a clear relationship between survival and concentration when exposed to mirex in water for 24 hr. Postlarvae exposed to mirex in water for 96 hr, with 10 prawns/test container, exhibited reduced survival with increasing mirex concentration. Individually exposed postlarvae (96 hr) did not exhibit such a distinct mortality pattern. A significant increase in length of molt intervals with increasing concentration was found for postlarvae individually exposed to mirex in water for 96 hr. Potential production figures, calculated from data for prawns individually exposed, indicate an increase in production (wet wt) of controls 2.24 and 1.70 times that of prawns exposed to 100 and 10 μg/l, respectively. Mirex residues in the tested postlarvae generally increased with increasing mirex concentration. Residues of mirex in postlarvae exposed to mirex for 24 hr (no food was present during the exposure period) suggest that *M. rosenbergii* can absorb mirex from the surrounding water. Water samples showed a marked decrease in mirex residues after 96 hr. (Author abstract by permission)

81-2963. Shipitsina, Zh. A. (All-Union Res. Inst. Vet. Sanit., Moskow D-22, USSR) **Izuchenie khronicheskogo otravlennya gardonoi. [Chronic poisoning with Gardona.]** *Veterinariya (Moscow)* (5): 55-56; 1981 (Russian).

The toxicity of Gardona (tetrachlorvinphos) was studied in 12 calves, each calf received daily doses of 0.04, 0.02, or 0.01 LD50 in its fodder for 90 days. During chronic poisoning, wt gain decreased, cholinesterase activity was inhibited, and organs and tissues accumulated Gardona. A dose of 3.6 mg Gardona/kg fodder was ineffective. This dose may be used as a starting point in establishing a maximum permissible residual quantity of pesticide in fodder. The minimal effective dose was 8.4 mg Gardona/kg fodder.

81-2964. Shcherban', N. F.; Khomitskii, F. V.; Shmatokova, A. I.; Alpatova, G. P.; Golosnitskii, A. K.; Kareva, E. P.; Voskresenskaya, T. G.; Chernukhina, N. M. (North Caucasian Zonal Vet. Res. Inst., USSR) **Sluchai otravleniya svinei prozvodnymn kumarina. [A case of poisoning of swine with coumarin derivatives.]** *Veterinariya (Moscow)* (5): 58-59; 1981 (Russian).

A case of dicoumarin (dicumarol) poisoning in swine in 1977 is reported. Symptoms appeared after the swine ate fodder containing yellow sweet clover; symptoms and the pathological-anatomical picture were described. A second case of coumarin poisoning of unknown etiology was described. Although rat extermination had not been performed and zoocoumarin (warfarin) was not stored on the farm, zoocoumarin poisoning was the apparent cause. Sweet clover was not present in fodder. These cases confirm the high toxicity of dicoumarin and zoocoumarin, and the high sensitivity of swine to these preparations. Such poisoning should be prevented by monitoring fodder. Special care must be taken when zoocoumarin is used for rat extermination.

81-2965. Kuz'minskaya, U. A.; Ivanitskii, V. A. (All-Union Res. Inst. Hyg. & Toxicol. Pestic. Polym. & Plast., USSR) **Sostoyanie sistemy katekholaminov pri postuplenii polikhorkamfena v organizm belykh krys. [Status of the catecholamine system during uptake of polychlorcamphene in albino rats.]** *Zh. Eksp. Klin. Med.* 21(2): 132-135; 1981 (6 references) (Russian).

The status of the catecholamine (CA) system in albino rats after polychlorcamphene (PCC, toxaphene) administration was elevated by determining excretion of adrenaline, noradrenaline, dopamine and dihydroxyphenylalanine in urine and content of these substances in myocardium. A single administration of a large dose of PCC caused temporary disorganization of the CA system, which may be considered to be a sign of stress. Prolonged uptake of PCC led to development of adaptive-compensatory shifts. CA system changes in myocardium were adaptive-compensatory in both cases, tending to maintain homeostasis.

See also 81-2701, 81-2702, 81-2706, 81-2707, 81-2709, 81-2711, 81-2713, 81-2715, 81-2716, 81-2717, 81-2718, 81-2719, 81-2720, 81-2721, 81-2722, 81-2723, 81-2724, 81-2725, 81-2726, 81-2727, 81-2728, 81-2729, 81-2730, 81-2731, 81-2732, 81-2733, 81-2734, 81-2735, 81-2737, 81-2738, 81-2739, 81-2741, 81-2742, 81-2744, 81-2745, 81-2746, 81-2747, 81-2748, 81-2756, 81-2777, 81-2780, 81-2795, 81-2806, 81-2808, 81-2811, 81-2812, 81-2813, 81-2816, 81-2820, 81-2821, 81-2822, 81-2823, 81-2824 *and* 81-2991.

81-2966. Farrington, D. S.; George, D. A.; Woollam, C. J.; Bratton, G. J. (Dep. Ind., Lab. Gov. Chem., Cornwall House, London SE1 9NQ, England) **Determination of bromoxynil and ioxynil in technical bromoxynil and ioxynil esters by high-performance liquid chromatography, gas-liquid chromatography and titrimetry.** *Analyst (London)* 106(1263): 713-717; 1981 (5 references).

Bromoxynil octanoate (2,6-dibromo-4- cyanophenyl octanoate) and ioxynil octanoate (4-cyano-2,6-diiodophenyl octanoate) are used as contact herbicides for control of broad-leaved weeds in cereals. Both are formulated in combination with each other and with a range of phenoxyalkanoic herbicides. As registration authorities may require declaration of the content of impurities in the esters, it is useful to be able to determine the free bromoxynil and ioxynil contents. These may be determined by measuring the free acid content of the ester by titration with sodium hydroxide solution, but this technique does not give a positive identification of the acids present. There are no published specific methods for the determination of free hydroxybenzonitriles in commercial esters, so a high-performance liquid chromatographic (HPLC) method was developed to meet this requirement. The results were then compared with those obtained by methylation and gas-liquid chromatography (GLC) and by titrimetry. (Author abstract by permission)

81-2967. Comm. Anal. Methods Residues Pestic. & Vet. Prod. Foodstuffs (Minist. Agric. Fish. Food, Agric. Sci. Serv., Hatching Green, Harpenden, Herts AL5 2BD, England) **Determination of residues of dithiocarbamate pesticides in foodstuffs by a headspace method.** *Analyst (London)* 106(1264): 782-787; 1981 (14 references).

A headspace method for determining dithiocarbamate residues in food is described. Samples of vegetables and fruits were prepared (diced) immediately after picking. Fifty g of sample were placed in a 250-ml bottle fitted with a rubber septum cap. Fifty ml of 1.5% tin (II) chloride-hydrochloric acid were added, and the mixture was incubated for 15 min at 80°C. The bottle was alternately shaken and heated for 1 hr. After 1 hr 10-100 μl of headspace was removed and injected into a gas chromatograph with a flame photometric detector in the sulfur mode. The peak heights were compared to calibration peaks to determine the level of carbon disulfide in the sample. This method is recommended for a wide variety of foodstuffs.

81-2968. Kratochvil, B.; Al-Daher, I. M. (Dep. Chem., Univ. Alberta, Edomonton, Alberta T6G 2G2, Canada) **Coulometric determination of herbicide containing nitro groups by reduction with electro-generated chromium (II).** *Analyst (London)* 106(1264): 796-799; 1981 (5 references).

A method for μmol determination of the purity of nitro-containing herbicides is presented. Coulometric titrations were conducted on samples of the herbicides DNOC, dinoseb, nitrofen, and trifluralin. The end points for DNOC and DNBP were sharp, and provide adequate precision. Those of nitrofen and trifluralin were too drawn out to be satisfactory for analytical use.

81-2969. Keith, L. H. (Radian Corp., Austin, TX 78766) **Analysis of toxic chemicals in the environment.** In: *Dynamics, Exposure and Hazard Assessment of Toxic Chemicals.* Haque, R., ed. (Ann Arbor Sci. Publ. Inc.: Ann Arbor): CH07: 41-45; 1980.

A cost-effectiveness decision framework and a technical evaluation decision framework for the development of an environmental analytical program are presented. The cost-effectiveness framework requires selection of parameters to be measured, choice between qualitative and quantitative analyses, choice between tentative or confirmed identification, and consideration of the analytical concentrations required. The technical decision framework includes consideration of techniques for sample accumulation concentration, fractionation, derivatization, separation, identification, and quantification. Errors made at these decision points will result in higher analytical costs, misrepresentative or incomplete data, or no usable information.

81-2970. Sharma, S. K.; Dave, J. M. (Sch. Environ. Sci., Jawaharial Nehru Univ., New Delhi 110067, India) **Characterization of DDT in factory effluent by thin-layer chromatography.** *Environ. Int.* 4(5-6): 391-395; 1980 (22 references).

A reliable and inexpensive thin layer chromatographic technique for the monitoring of DDT in the effluent of pesticide manufacturing plants is described. Aqueous untreated and treated grab and composite effluent samples from a DDT manufacturing site in India were extracted and chromatographed on silica gel both qualitatively and quantitatively for analysis of *p,p'*-DDT and related compounds. DDT was detected in all samples with resolution of *o,p'*-DDT, *o,p*- and *p,p'*-DDE, and isomers of TDE. Separation and recovery efficiency for quantitative estimates were on the order of 94-95%. The method was sensitive to 5 μg or less. When silver nitrate was incorporated onto the absorbent layer, levels of 5-200 ng of organochlorine pesticide could be detected. The present technique is recommended for developing countries whose use of pesticides is high and whose laboratories have a shortage of skilled personnel to conduct more complicated monitoring tests.

81-2971. Lawrence, J. F.; Panopio, L. G.; Lewis, D. A.; McLeod, H. A. (Food. Res. Div., Health Prot. Branch, Tunney's Pasture, Ottawa, Ontario K1A 0L2,

Canada) **Determination of the insecticide/acaricide formetanate in fresh fruit by reversed-phase liquid chromatography.** *J. Agric. Food Chem.* 29(4): 722-724; 1981 (7 references).

Formetanate {*m*-[[(dimethylamino) methylene] amino]phenyl methylcarbamate} was extracted from fresh samples of oranges, apples, plums, peaches, and pears with acidified acetonitrile. An aliquot of the filtered extract was evaporated to an aqueous residue, which was cleaned up by alternate acidic and basic aqueous-organic partitions. The final residue was dissolved in distilled water for analysis by liquid chromatography on an RP-18 reversed-phase column with a mobile phase consisting of 35% acetonitrile in 0.01 *M* ammonium phosphate, monobasic (pH 8.0), and UV detection at 254 mm. Average recoveries at ≥ 0.5 ppm were over 80%. At the 0.1-ppm level average recoveries were generally 70% or higher. Minimum detectable levels were estimated to be ~ 0.02-0.05 ppm in the fruits studied. Results from a limited survey of fruits from 5 regions of Canada are also presented. No formetanate was detected above the detection limit of 0.02-0.05 ppm in any of the 92 samples tested. (Author abstract reprinted by permission of the American Chemical Society, modified)

81-2972. Draper, W. M.; Street, J. C. (Dep. Anim. Dairy & Vet. Sci., Utah State Univ., Logan, UT 84322) **Determination of norflurazon and desmethylnorflurazon in plant tissue by high-pressure liquid chromatography.** *J. Agric. Food Chem.* 29(4): 724-726; 1981 (2 references).

A general method for the determination of norflurazon and its major metabolite, *N*-desmethylnorflurazon, is described. The procedure was applied to the analysis of residues in 8 major fruit crops on which the herbicide is registered. Mean recoveries were 94% for norflurazon and 79% for desmethylnorflurazon. A time-consuming Soxhlet extraction, utilized in existing methods, has been eliminated and extraction achieved by blending/partitioning. Residues are isolated by adsorption chromatography, and quantitative analysis is accomplished with a liquid chromatograph fitted with a reverse-phase column and UV-absorbance detector. Minimum detectable quantities for each residue were below 0.1 μg/g (ppm) in the crops tested. (Author abstract reprinted by permission of the American Chemical Society)

81-2973. Gustafsson, K. H.; Thompson, R. A. (Hogskolan i Kalmar, S-39129 Kalmar, Sweden) **High-pressure liquid chromatographic determination of fungicidal dithiocarbamates.** *J. Agric. Food Chem.* 29(4): 729-732; 1981 (29 references).

A specific method for determination of thiram, salts of alkylenebis(dithiocarbamic acids), and *N,N*-dimethyldithiocarbamic acid is presented. Iron, zinc, and manganese salts were transformed into water-soluble sodium salts with an alkaline EDTA solution. The extract was subjected to ion-pair methylation at pH 6.5-8.5 in chloroform-hexane. The organic phase was concentrated and analyzed by HPLC and UV detection at 272 nm. Thiram was reduced by nabam into *N,N*-dimethyldithiocarbamate, a reaction which was avoided by extracting with chloroform. However, extraction with chloroform of apple samples drastically reduced the recovery of ethylenebis(dithiocarbamates). Thiram was preferably determined after extracting with chloroform and purifying the extract on a silica gel column. The limit of detection in water solutions for zineb, ziram, and thiram was 0.05, 0.01, and 0.01 ppm, respectively, and the recovery from apple samples fortified at the 1.0-ppm level was 61, 88, and 88% in the order mentioned. (Author abstract reprinted by permission of the American Chemical Society)

81-2974. Wilson, A. M.; Bushway, A. A.; Bushway, R. J. (Dep. Food Sci., Univ. Maine, Orono, ME 04469) **Residues analysis of isopropyl *N*-(3-chlorophenyl) carbamate in fruits and vegetables using high-performance liquid chromatography.** *J. Agric. Food Chem.* 29(4): 746-749; 1981 (17 references).

A high-performance liquid chromatographic method was developed for the determination of residues of isopropyl *N*-(3-chlorophenyl) carbamate (CIPC; chlorpropham) in Monona potatoes at levels of 0.25-81 ppm and in beans, peas, and blueberries fortified at 0.25 ppm. CIPC was extracted with methanol, and the extract was cleaned up by being chromatographed through an acid alumina column. The average recoveries from all 4 commodities ranged from 64 to 102%. A study conducted to test 16 pesticides for possible interferences with CIPC demonstrated that none of the 16 cochromatographed. The lower limit of detection by using this method for beans, peas, potatoes, and blueberries is 0.12 ppm. (Author abstract reprinted by permission of the American Chemical Society)

81-2975. Nigg, H. N.; Albrigo, L. G.; Nordby, H. E.; Stamper, J. H. (Univ. Florida, IFAS, Agric. Res. & Educ. Cent., Lake Alfred, FL 33850) **A method for estimating leaf compartmentalization of pesticides in citrus.** *J. Agric. Food Chem.* 29(4): 750-756; 1981 (22 references).

A method for estimating surface, wax, and cellular pesticide residues of the citrus leaf is presented. Electron microscopy showed little alcohol penetration of the cell in a short surface strip. Methanol compared with the dislodgeable surface strip as a wax solvent. Chloroform was the most efficient wax solvent, penetrated to the cell, but left the cell membrane intact. Parathion in methanol did not partition into leaf wax or cell whereas 27% leaf partitioning occurred with the dislodgeable solvent. Low percentages of systemic acephate were removed with a

methanol surface strip or a chloroform wax strip. The final method consists of a 1-min methanol surface strip, a 1-min chloroform wax strip, and a final analysis of penetrated residues. (Author abstract reprinted by permission of the American Chemical Society)

81-2976. Greenberg, R. S. (Plant Prot. Dep., Minist. Agric., Jaffa 61150, Israel) **Determination of fenvalerate, a synthetic pyrethroid, in grapes, peppers, apples, and cottonseeds by gas-liquid chromatography.** *J. Agric. Food Chem.* 29(4): 856-860; 1981 (9 references).

Two methods are described for the determination of fenvalerate (*α*-cyano-*m*-phenoxybenzyl *α*-isopropyl-*p*-chlorophenylacetate) residues in grapes, peppers, apples, and cottonseeds. In grapes, peppers, and apples, acetone extraction was followed by partitioning with petroleum ether (40-60°C). In cottonseeds, Soxhlet extraction (after blending) was followed by partitioning with propylene carbonate. The same cleanup method (Florisil) was used in each case. In grapes, initially fortified with 0.005-0.5 ppm of fenvalerate, the average recovery was 96-98%; in peppers fortified with 0.005-1.0 ppm, the recovery was 94-99%; in apples (0.01-1.0 ppm) it was 97-99%; in cottonseeds (0.01-0.2 ppm) it was 80-93%. The limit of detection was 0.005 ppm for grapes and peppers and 0.01 ppm for apples and cottonseed. Values obtained for fenvalerate residues in field-treated samples of grapes, peppers, apples, and cottonseeds are also presented. (Author abstract reprinted by permission of the American Chemical Society)

81-2977. Lee, Y. W.; Westcott, N. D. (Res. Stn., Res. Branch, Agric. Canada, Saskatoon, Saskatchewan S7N 0X2, Canada) **Gas chromatographic quantitative analysis and persistence of dimethoate and dimethoxon residues on and in wheat plants.** *J. Agric. Food Chem.* 29(4): 860-862; 1981 (8 references).

Wheat plants fortified with dimethoate and dimethoxon were blended and extracted with chloroform. The concentrated extract was passed through a silica gel column, evaporated, and injected into a gas chromatograph equipped with a flame photometric detector and a column containing 12% OV-101 and 1.2% Carbowax 20M on Chromosorb W. Recoveries of dimethoate and dimethoxon were about 92% and 89%, respectively, in the range of 0.02-10 ppm. Dimethoate was applied to wheat plants seeded on 3 dates. Samples were collected 0.17 days after application. The dimethoate residues were 63.2, 41.5, and 17.4 ppm immediately after application and were 0.02, 0.36, and 0.52 ppm by 17 days after application. Dimethoate concentration decreased more rapidly on the younger wheat plants. Dimethoxon concentrations increased and then decreased more rapidly on the younger wheat plants. (Author abstract reprinted by permission of the American Chemical Society)

81-2978. Lawrence, J. F.; Panopio, L. G.; McLeod, H. A. (Food Res. Div., Health Prot. Branch, Tunney's Pasture, Ottawa, Ontario K1A 0L2, Canada) **Analysis of difenzoquat herbicide in wheat products by reversed-phase liquid chromatography.** *J. Agric. Food Chem.* 29(4): 887-889; 1981 (8 references).

Difenzoquat(1,2-dimethyl-3,5-diphenylpyrazolium methyl sulfate), a herbicide used for the control of wild oats, was determined in wheat products by reversed-phase ion-pair chromatography employing a LiChrosorb PR-8 column and a mobile phase of 70% acetonitrile in water containing 0.01 *M* sodium octanesulfonate, adjusted to pH 3.0. Samples of bread, cereal, and flour were extracted with acidified acetonitrile, which was cleaned up by aqueous/organic partitions at acidic and basic pH values. The organic extract was then further purified by passing through an alumina column. The elution fraction containing the difenzoquat was evaporated to dryness and dissolved in the mobile phase for analysis. Recoveries of spiked samples over the range 0.5-10.0 ppm averaged 88.6% with a range of 83.5-99.2%. At 0.1 ppm, the average recovery was 75.3% with a range of 68.1-85.9%. The detection limit was estimated to be ~ 0.02 ppm in the samples studied. (Author abstract reprinted by permission of the American Chemical Society)

81-2979. Saxena, M. C.; Siddiqui, M. K. J. (Ind. Toxicol. Res. Cent., Lucknow, India) **Reduced recovery of dieldrin residues – a shortcoming of sulfuric acid cleanup of biological samples.** *J. Anal. Toxicol.* 5(3): 150-152; 1981 (12 references).

Investigators have reported problems in quantifying dieldrin when cleanup is done by concentrated sulfuric acid. *In vitro* experiments were conducted to study the optimum conditions for successful cleanup of dieldrin involving sulfuric acid without loss of dieldrin, and to identify the reaction product. Different concentrations of sulfuric acid were prepared. An aliquot of dieldrin standard was pipetted into each test tube followed by gentle shaking for 30 sec. The tubes were allowed to stand for 2 min at room temperature. The supernatant was transferred to glass-stoppered containers. Collected supernatant was quantified for dieldrin on a gas-liquid chromatograph using an electron capture detector. These studies indicate that severe breakdown in the recovery of dieldrin can be avoided if 65% (v/v) sulfuric acid is used instead of concentrated acid. Infrared spectrophotometric studies suggest that, at concentrations above 75% sulfuric acid, the epoxide ring attached to the norbornene nucleus of dieldrin undergoes rearrangement to form keto-dihydroaldrin.

81-2980. Hargesheimer, E. E.; Coutts, R. T.; Pasutto, F. M. (Fac. Pharm. & Pharm. Sci., Univ. Alberta, Edmonton, Alberta T6G 2N8, Canada) **Gas-liquid chromatographic determination of aniline metabolites of**

substituted urea and carbamate herbicides in aqueous solution. *J. Assoc. Off. Anal. Chem.* 64(4): 833-840; 1981 (20 references).

A simple gas-liquid chromatographic (GLC) method has been developed which provides sensitivity and specificity for the analysis of complex mixtures of the commonly occurring herbicide metabolites aniline, 3-chloroaniline, 4-chloroaniline, 4-bromoaniline, and 3-chloro-4-methylaniline. All of these anilines react with acetic anhydride directly in basified aqueous solution. Further reaction of the acetylated anilines with trifluoroacetic anhydride gave diacyl derivatives which were readily resolved by gas chromatography. The structures of the *N*-acetylated and *N*-trifluoroacetylated derivatives of benzylamine (internal standard) and the anilines were confirmed by GLC-mass spectrometry. In distilled water the minimum detectable concentrations of aniline and the substituted anilines, using electron capture GLC, are 0.1 nmol/100 ml and 0.05 nmol/100 ml, respectively. The detection limit for the anilines is 1 nmol/100 ml distilled water, using GLC with flame ionization detection. The technique was applied to the determination of anilines added to urine samples obtained from the general population. (Author abstract by permission)

81-2981. Nanda Kumar, N. V.; Prameela Devi, Y. (Dep. Zool., Sri Venkateswara Univ., Tirupati 517502, India) **Portable and sensitive detector strips for rapid detection of organophosphorus, mercury, copper, cadmium, and silver compounds.** *J. Assoc. Off. Anal. Chem.* 64(4): 841-843; 1981 (12 references).

Portable and sensitive detector strips developed for rapid detection of organophosphorus, mercury, copper, cadmium, and silver compounds are inexpensive, indefinitely stable, and easy to use. The strips require mild moistening with distilled water and warming for the reaction involving cholinesterase and succinate dehydrogenase inhibition by organophosphorus and heavy metal compounds, respectively. The detector strips, designated A, B, and C, can be combined to detect heavy metals and organophosphates as their oxygen analogs at nanogram concentrations in 5-10 min with little cleanup, so the strips can be used under field conditions. (Author abstract by permission)

81-2982. Sattar, M. A. (Dep. Chem., Univ. Jyvaskyla, SF-40100 Jyvaskyla 10, Finland) **Thin-layer chromatography of phenoxyacetic acid herbicides.** *J. Chromatogr.* 209(2): 329-333; 1981 (17 references).

Techniques for analysis of phenoxyacetic acid herbicides by thin layer chromatography are described. Samples of 2,4-D, 2,4,5-T and their PFB bromide derivatives were used in the study. Samples were extracted with hexane and diethyl ether. Forty-five solvent systems for thin layer chromatography were tested. Silica gel and alumina layers were each used with each of the test solvents. Results indicated that the efficiency of the technique varies and is a function of the particular combination of solvent, layer material, and herbicide formulation.

81-2983. Maguire, R. J.; Huneault, H. (Environ. Contam. Div., Natl. Water Res. Inst., Canada Cent. Inland Waters, Dep. Environ., Burlington, Ontario L7R 4A6, Canada) **Determination of butyltin species in water by gas chromatography with flame photometric detection.** *J. Chromatogr.* 209(3): 458-462; 1981 (11 references).

A method is described for the determination of bis(tri-*n*-butyltin) oxide (TBTO) and some of its possible dealkylation products in natural waters. The approach involves making *n*-pentyl derivatives of TBTO and its dealkylation products. The minimum detectable amounts injected were about 100 pg of all 4 derivatives tested with linear responses over concentration ranges of at least 100. The 4 derivatives included Bu_3PeSn, Bu_2Pe_2Sn, $BuPe_3Sn$, and Pe_4Sn. The reproducibility of the peak area with multiple injections was excellent. Mass spectra reveal the typical tin cluster as well as losses of butyl and pentyl. The striking feature is the disappearance of the cluster centered at m/e 179 ($BuSnH_2^+$) and the appearance of the cluster centered at m/e 193 ($PeSnH_2^+$) as n decreases in the series $Bu_nPe_{4-n}Sn$.

81-2984. Ogierman, L. (Inst. Plant Prot., Dep. Anal. & Qual. Control Pestic., PL-44153 Sosniocowice, Poland) **Gas-liquid chromatography of selected benzimidazole fungicides by flash-heater methylation with trimethylanilinium hydroxide.** *J. Chromatogr.* 210(1): 83-92; 1981 (15 references).

A new method of methylation of benomyl, thiabendazole and fuberidazole (systemic benzimidazole fungicides) was established, based upon the flash-heater reaction with trimethylanilinium hydroxide. The chromatographic response was observed to be linear with the concentration of synthetic standards and the flash-heater products of the examined fungicides. The methyl derivatives were identified spectroscopically. (Author abstract by permission)

81-2985. Westcott, J. W.; Bidleman, T. F. (Dep. Chem., Univ. South Carolina, Columbia, SC 29208) **Determination of polychlorinated biphenyl vapor pressures by capillary gas chromatography.** *J. Chromatogr.* 210(2): 331-336; 1981 (10 references).

The use of glass capillary gas chromatography for determining the vapor pressures of individual polychlorinated biphenyl (PCB) isomers and chlorinated pesticides is reported. Selectivity in gas-liquid chromatography is influenced by the volatility of the solute

and by chemical interactions between the solute and the stationary phase. If chemical effects can be eliminated or at least minimized, partitioning between the stationary and mobile phases is controlled by solute volatility. The 1 m WCOT column used in the experiments was of lower efficiency than the 30-50 m columns normally used for analytical separations. However, the resolution of the column was sufficient to allow several compounds to be chromatographed simultaneously. The use of a longer column would have been inconvenient due to the extremely long retention times for compounds of low vapor pressure at low column temperatures. On the 1 m column, 40 min were required to elute 2,4,5-T isobutyl ester at 70°C and 3 ml/min carrier gas flow-rate. The vapor pressures determined for the solid individual PCB isomers are about 5-10 times lower than those reported for the liquid commercial mixtures.

81-2986. Sonobe, H.; Carver, R. A.; Kamps, L. R. (Kirin Brewery Co. Ltd., Jingumae, Shibuyaku, Tokyo 150, Japan) **Reversed-phase high-performance liquid chromatographic separation of carbofuran and its five metabolites.** *J. Chromatogr.* 210(2): 356-359; 1981 (10 references).

The HPLC separation of carbofuran and its 5 nonconjugated metabolites (3-hydroxycarbofuran, 3-hydroxy-7-phenol, 3-ketocarbofuran, 3-keto-7-phenol and 7-phenol) is described using a C18 reversed-phase column. Two solvent systems were investigated: acetonitrile-water isocratic elution, and a methanol-water gradient elution. With the second system, the resolution of carbofuran and its 5 metabolites was satisfactory. Some problems with the stability of 3-ketocarbofuran were encountered. The method was applied to the separation of carbofuran and metabolites in extracts of root crops. It is suggested that this separation, with UV determination at 220 nm, may be useful for the quantitative determination of carbofuran residues in some samples without cleanup of the extracts. However, in most cases cleanup of sample extracts before HPLC determination will be needed.

81-2987. Miura, K.; Nakamura, H.; Tanaka, H.; Tamura, Z. (Fac. Pharm. Sci., Univ. Tokyo, Bunkyo-ku, Tokyo 113, Japan) **Fluorescence detection of 8-hydroxyquinoline and some of its halogenated derivatives using post-column derivatization in high-performance liquid chromatography.** *J. Chromatogr.* 210(3): 536-539; 1981 (4 references).

A method is presented by which 8-hydroxyquinoline compounds, which are used as fungicides, are detected by fluorescence. Each test compound is chelated with Mg, which provides the highest relative fluorescence intensities. Chelation was performed in the post-column phase of analysis. The compounds separated by this method were 5-chloro-, 5,7-dichloro and 5-chloro-7-iodo-8-hydroxyquinoline. This method can be used for the analysis of other compounds having an 8-hydroxyquinoline skeleton.

81-2988. Bushway, R. J. (Dep. Food Sci., Univ. Maine, Orono, ME 04469) **High-performance liquid chromatographic determination of carbaryl and 1-naphthol at residue levels in various water sources by direct injection and trace enrichment.** *J. Chromatogr.* 211(1): 135-143; 1981 (50 references).

A high-performance liquid chromatographic method is described for determining carbaryl and its hydrolysis product, 1-naphthol in water at residue levels by direct injection and trace enrichment. Water from 3 sources, public water supply, stream and the ocean, was analyzed for carbaryl and 1-naphthol at concentrations as low as 3.78 and 10 ppb, respectively, without a clean-up, concentration or derivatization step. Carbaryl was detected at 0.1 ppb and 1-naphthol at 0.5 ppb by employing a concentration step involving a C_{18} Sep-Pak cartridge. The coefficient of variation for all determinations ranged from 2.5 to 10.7%. Fourteen other widely used pesticides [carbofuran, methomyl, thiram, azinphos-methyl, benomyl, monuron, diuron, propham, chlorpropham, pentachlorophenol (PCP), the oxygen analogue of azinphosmethyl, pentachloronitrobenzene (quintozene), simazine and atrazine] were chromatographed using this system. Pentachloronitrobenzene, diuron, and thiram interfered with the determination of 1-naphthol, while atrazine co-chromatographed with carbaryl. (Author abstract by permission)

81-2989. Lawrence, J. F. (Food Res. Div., Food Dir. Health Prot. Branch, Tunney's Pasture, Ottawa, Ontario, Canada) **Use of 214-nm and 229-nm discrete-line sources for the UV absorbance detection of some pesticides separated by high-performance liquid chromatography.** *J. Chromatogr.* 211(1): 144-149; 1981 (4 references).

Two discrete line sources (214 and 229 nm) are evaluated in the detection of some pesticides separated by HPLC. The pesticides studied included carbaryl, carbofuran, atrazine, barban, metobromuron, methabenzthiazuron, and pentachlorophenol (PCP). While sensitivity is very important in determining pesticide residues in environmental samples, selectivity is of equal importance. In a comparison of results for carbaryl, spiked in an apple extract, the decrease in selectivity from 254 to 214 nm was insignificant compared to the almost 30-fold increase in sensitivity. The 2 line sources typically demonstrated about 4 times lower background noise than the Pye LC-3 variable-wavelength detector. As a result, the 2 fixed wavelengths generally produced better results on a signal-to-noise basis over most of the region for the compounds studied.

81-2990. Dufek, P.; Packova, V.; Zivny, K. (Isot. Lab., Inst. Biol. Res., Czechoslovak Acad. Sci., CS-14220 Prague 4, Czechoslovakia) **Gas chromatographic behaviour of mono- and dihydroxybiphenyls on various silicone phases.** *J. Chromatogr.* 211(1): 150-154; 1981 (23 references).

The gas chromatographic behavior of some hydroxylated biphenyls, which are possible photodecomposition products of phenols, was investigated. Phenols may be introduced into the environment in insecticides and herbicides. Nine mono- and dihydroxybiphenyls were studied on 5 stationary phases; OV-101, OV-17, OV-210, OV-225, and XE-60. The retention indices on the OV-101 phase were about 150-500 units lower than on the OV-17 and OV-210 phases, and about 150-1500 units lower than on the OV-225 and XE-60 phases. On the OV-101, 3- and 4-HBP were poorly separated and 3,3′- and 4,4′-DHBP were not separated at all. Although the OV-17 and OV-210 phases differ considerably in their polarity, the retention indices for the hydroxylated biphenyls were similar. The relatively high retention indices on the OV-17 phase are due to the considerably higher solubility of these substances in the phenolic stationary phase. All 9 compounds were separable on the OV-17 phase.

81-2991. DeNeef, J. H.; Porsius, A. J.; Van Rooy, H. H. (Dep. Pharm., Univ. Amsterdam, Amsterdam, The Netherlands) **Quantitative analysis of the cholinesterase inhibitor paraoxon in brain tissue using high-performance liquid chromatography.** *J. Chromatogr.* 224(1): 133-138; 1981 (13 references).

A sensitive high-performance liquid chromatography (HPLC) method of the determination of paraoxon in the presence of its hydrolysis product, 4-nitrophenol, in brain tissue of the cat is described. Concentrations of paraoxon in various brain tissues after iv administration of various doses of paraoxon in cats are presented. The liquid chromatograph used comprised a constant-flow pump, a high-pressure injection valve equipped with a 250 μl sampling loop, and a variable-wavelength UV detector. The wavelength was set at 274 nm. The HPLC columns were packed by a pressurized balanced slurry method. The slurry liquid consisted of a mix of tetrabromoethane and chloroform of specific gravity of 2.09 for the bare silica. The hydrolysis of paraoxon was demonstrated by the significantly smaller amounts detected 10 min after dosing the cats. However, due to the detection limit, paraoxon could not be determined quantitatively 10 min after dosing with 150 μg/kg. The presence of paraoxon was also established by the determination of acetylcholinesterase activity. The decrease of paraoxon concentration was accompanied by a reduction of the inhibitory effect on acetylcholinesterase activity.

81-2992. Korfmacher, W. A.; Mitchum, R. K. (Natl. Cent. Toxicol. Res., Dep. Health & Human Serv., Public Health Serv., US FDA, Jefferson, AR 72079) **Separation of 3 tetrachlorodibenzofuran isomers via fused silica GC combined with API-MS.** *J. High Resolut. Chromatogr. Chromatogr. Commun.* 4(6): 294-295; 1981 (12 references).

A method is described by which 2,4,6,8-TCDF, 2,3,6,8-TCDF, 2,3,7,8-TCDF, and 2,3,7,8-TCDD are separated. An extranuclear atmospheric pressure ionization mass spectrometer (API-MS) with a 50 m SP2100 fused silica capillary column was employed, using helium as the carrier gas. The anions formed from the tetrachlorobenzofurans did not interfere with the determination of 2,3,7,8-TCDD by this method.

81-2993. Basch, A.; Wasserman, T. (Israel Fiber Inst., Jerusalem 91080, Israel) **Determination of pentachlorophenol laurate by high pressure liquid chromatography.** *J. Liquid Chromatogr.* 4(5): 785-790; 1981 (6 references).

The high pressure liquid chromatographic determination of the laurate ester of PCP (PCPL), which is used as a fungicide to inhibit the decomposition of fabrics in contact with soil, is described. A sample of canvas treated with PCPL was extracted with acetonitrile in hexane; the extract was chromatographed on silica gel. The method yields only 1 peak for PCPL; other reported methods give multiple peaks. In addition, this method is more rapid and less subject to the interferences than other methods. This determination is sensitive for fabrics containing 1-7% PCPL.

81-2994. Migdalof, B. H. (Dep. Drug Metab., Squibb Inst. Med. Res., Princeton, NJ 08540) **The use of thin-layer chromatography in experimental xenobiology.** *J. Liquid Chromatogr.* 4(6): 931-953; 1981 (6 references).

Thin-layer chromatography (TLC) assays are frequently chosen for the analysis of xenobiotics or their transformation products in biosamples. Xenobiotics may include such compounds as fungicides, herbicides, antimicrobial agents, antihelmintics, antiinflammatory drugs, antiviral substances, antitumor agents and other antiproliferative compounds. TLC may be employed to assess the radiochemical purity of labeled xenobiotics, their extent of metabolism, their blood and excreta metabolic profile, and their stability in various biosamples. To isolate specific xenobiotic metabolites, preparative TLC is often utilized. Thin-layer radiochromatography has been used to evaluate the pharmacokinetics of drugs and other xenobiotics in animals and humans. Some advantages of TLC over gas or high pressure liquid chromatography for the study of radiolabeled xenobiotics are discussed.

81-2995. Girenko, D. B.; Klisenko, M. L. (Author address not given) **Zakonomernosti ekstraktsii fosfororganicheskikh pestitsidov iz vody. [Regularities of extraction**

of organophosphorus pesticides from water.] *Khim. Sel'sk. Khoz.* 19(5): 58-60; 1981 (9 references) (Russian).

Distribution coefficients (D) were given for the organophosphorus insecticides Gardona (tetrachlorvinphos), Khostakvik, metaphos (methyl parathion), methylnitrophos, bromophos, Cyanox (cyanophos), Afugan (pyrazophos), carbophos (malathion), phencapton, Cidial (phenthoate), phthalophos (phosmet), Amiphos (DAEP), Anthio (formothion), and phosphamide (dimethoate). Maximal values of D were observed in solvents permitting formation of hydrogen bonds between the solvent molecule and unshared electron pairs in amide or carbonyl groups. Data were presented on the effect of solvent type on extraction of pesticides from water. Aliphatic hydrocarbons extracted amides not more than 35%; solvents forming π-complexes, up to 50%; the degree of extraction of preparations with polar solvents was 80-95%. The type of solvent had almost no effect on the degree of extraction of organophosphorus pesticides that did not contain groups that facilitate formation of hydrogen and other bonds. Selection of the appropriate pH was also important.

81-2996. Maier, D.; Scholl, W. (Staatl. Landwirtsch. Unters. & Forschungsanst. Augustenberg, D-7500 Karlsruhe-Durlach, BRD) **Ditrapex. Analytische Bestimmung und Verhalten im Boden. [Analytical determination of Di-trapex, and the behavior of Di-trapex in soils.]** *Landwirtsch. Forsch.* 33(4): 307-317; 1980 (2 references) (German).

An analytical method for determining the soil fumigant Di-Trapex residues in soil and water is described. The persistence of its components dichloropropane (I), dichloropropene (II), and methyl isothiocyanate (III) in soil was studied under laboratory and field conditions. Separation and concentration of the active substances is achieved by combined steam and vacuum distillation. The yield is boiled in water. The active agents contained in the gaseous phase are sucked by a water jet pump through a small quantity of hexane which, after drying with sodium sulfate, is subjected to gas chromatographic analysis. The recovery rate for III is 64%, for I 80% and for II 84%. Both laboratory and field tests revealed that migration of soil residues to lower strata (and thus into ground water) is small but dependent on the type of underlying soil; after 8 wk in the soil, penetration to lower strata equalled the analytical detection threshold.

81-2997. Sherma, J.; Regan, T. E. (Dep. Chem., Lafayette Coll., Easton, PA 18042) **Determination of asulam herbicide by thin layer chromatography with densitometry.** *Pesticides* 15(2): 21-24; 1981 (16 references).

A thin layer densitometric method for the determination of asulam residues in surface (river) water and spinach samples is described. Spiked samples of water and spinach were extracted and concentrated before analysis on Whatman LHPKF high performance silica gel pre-coated TLC plates. Asulam was detected as a red spot by diazotization and coupling with the Bratton-Marshall reagent. Recovery from spinach extract spiked at 0.20 ppm averaged 75.4%, and from river water spiked with 0.02 ppm, 83.9%. The present method may only be used to determine free asulam. Better reproducibility than colorimetry and column chromatography methods is obtained due to the fact that multiple samples may be analyze simultaneously under identical conditions.

81-2998. Batora, V.; Vitorovic, S. LJ.; Thier, H. P.; Klisenko, M. A.; Greenhalgh, R.* (CBRI, Agric. Canada, Ottawa, Ontario K1A 0C6, Canada) **Development and evaluation of simplified approaches to residue analysis.** *Pure Appl. Chem.* 53(5): 1039-1049; 1981 (61 references).

The Commission on Pesticide Chemistry reviews simplified methods for analyzing pesticide residues and their metabolites. The suitability of each method for screening food and environmental samples was considered of prime importance in the evaluation. Thin layer chromatography (TLC) is the most practical technique. It can detect organochlorine, organophosphorus, and carbamate insecticide residues as well as those of phenoxy, triazine, and urea herbicides. The accuracy of TLC is compared to that of gas chromatographic methods. TLC is useful in multi-residue determinations for identification as well as quantitation of the most important classes of pesticides. The Commission recommends establishment of a central point for the coordination of analytical results so that methods can continue to be shared and improved rapidly.

81-2999. Gocan, S.; Marutoiu, C. (Fac. Technol. Chim., Univ. Babes Bolyai, Cluj-Napoca, Romania) **Studiul influentei conditiilor de mediu asupra separarii unor pesticide organoclorurate prin cromatografia ascendenta pe strat subtire cu silicagel de inalta eficienta. [Study of the influence of atmospheric conditions on the separation of organochlorine pesticides by thin layer chromatography using a high performance silica gel.]** *Rev. Chim. (Bucharest)* 32(2): 166-169; 1981 (23 references) (Rumanian).

A mixture of γ-HCH (γ-BHC; lindane), aldrin and *p,p'*-DDT dissolved in benzene was used to test ascending chromatography procedures against 3 variables in test conditions: paper *vs.* TLC, TLC with silica gel R (grain size 10-40 μM) *vs.* TLC with a high performance silica gel (grain size 10 μm), and saturated *vs.* unsaturated chamber atmosphere. A significantly lower rate of solvent migration was noted in the case of the 10-μm gel and with the use of an unsaturated chamber. The lower rate of migration is considered advantageous in terms of separation efficiency.

81-3000. Abe, Y. (Pestic. Div., Sumitomo Chem. Co., Ltd., Osaka, Japan) **Pyrethroids for control of household insects.** *Riv. Ital. Sostanze Grasse* 58(1): 15-28; 1981 (5 references).

The evolution of synthetic pyrethroids is discussed. A procedure for the chromatographic analysis of pyrethroids is given, with detailed information for the determination of tetramethrin (Neo-Pynamic) and phenothrin (Sumithrin) in water-based formulations, and the preparation of the internal standard for allethrin (Pynamin-Forte) in mosquito mat. For analysis of the optical isomers of allethrin, the derivation of d-2-octanol ester from allethrin and determination of each isomer separately are recommended. Flow diagrams for the analysis and identification of pyrethroids and synergists in aerosol form are also presented.

See also 81-2715, 81-2718, 81-2736, 81-2755, 81-2779, 81-2783, 81-2784, 81-2785, 81-2786, 81-2790, 81-2806 *and* 81-2892.

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